Digitized by Arya Samaj Foundation Chennai and eGangotri

THE NEW

ILLUSTRATED UNIVERSAL REFERENCE BOOK

R
030
32

ODHAMS

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ओ३म्

पुस्तक संख्या..... ०३०
३२

पक्षिका संख्या.....

पुस्तक पर सर्व प्रकार की निशानियां लगाना वर्जित है। कोई सज्जन पन्द्रह दिन से अधिक देर तक पुस्तक अपने पास नहीं रख सकते। अधिक देर तक रखने के लिये पुनः आज्ञा प्राप्त करनी चाहिये।

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

030
32

Stock Verification-2024

NOT TO BE ISSUED
REFERENCE BOOK

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Copyright S. 1049. 1R.U.
Made and Printed in Great Britain by
Odhams (Watford) Limited, Watford.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

030/32
26367

THE NEW ILLUSTRATED

UNIVERSAL REFERENCE BOOK

CHECKED 1973
Initial

ODHAMS PRESS LTD · LONG ACRE · LONDON

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONTENTS

	PAGE
FOREWORD	5
A RAPID-REFERENCE WORLD HISTORY *The Record of Mankind from the Earliest Ages*	7
DICTIONARY OF DATES AND EVENTS *Important Happenings in the History of the World*	144
THE NEW HOUSEHOLD PHYSICIAN *Authoritative Advice on the Care of the Body in Health and its Treatment in Sickness*	151
THE POPULAR LAWYER *Legal Problems of Everyday Affairs Solved in a Way that is Easy for the Layman to Understand*	259
THE HOUSEHOLD COOKERY BOOK *The Whole Art of Preparing Food by Modern Methods and in Economical Ways, with Many Tested Recipes*	320
THE COMPLETE GARDENER *Complete Instructions on the Care of Gardens and Allotments, and Cultivation of Flowers, Fruit and Vegetables*	371
RADIO AND TELEVISION GUIDE *All About Radio and Television for the Amateur*	471
DOMESTIC PETS *With Dictionary of Canine Diseases and Authoritative Articles on Poultry-Keeping and Bee-Keeping*	502
THE HOME HANDYMAN *Practical Advice on a Multitude of Problems connected with the Upkeep of a House*	537
ENCYCLOPAEDIA OF GENERAL KNOWLEDGE *Essential Facts on Significant Subjects Required to Answer the Questions of Everyday Life*	626
PRACTICAL BUSINESS HANDBOOK *A Compendium of General Business Information*	742

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FOREWORD

THIS is a volume packed from cover to cover with facts. It is no mere encyclopaedia, attempting to cover every branch of human knowledge. Instead, attention has been focused on those subjects likely to be of use or of interest to the ordinary man and woman, and within those limits the maximum amount of vital information has been included. What constitutes vital information necessarily depends to some extent on the point of view of the reader. The following pages cover the main interests of humanity. No essential subject is left out, but certain phases of life are dealt with in greater detail than others.

It is a work of compression, without verbiage, clean-cut, and to the point. This does not mean that it is a kind of literary robot, endowed with every attribute other than the rich, warm glow of life. Some facts are hard as steel, unflinching and unbending. These must be accepted as such. Their value is self-evident, as the worth of a hammer is known to its user. But there are other facts, particularly those concerning some of the main interests of men and women, which are heavily endowed with fascinating and abiding interest. In an age of mechanization and social reform we are to have more leisure. The prophets have promised us this blessing for having shifted some of the burden from human hands and shoulders to the wheels and shafts of machines, and we must be prepared. Hence the inclusion of such subjects as the Complete Gardener, the Up-to-date Home Handyman, and so on. Even if the self-appointed Professors of Foresight prove to be wrong—as is not impossible—the need for recreation will be equally evident, and probably more so.

This is the day of immense power in small compass, of expansion by contraction, to use a paradox. Hence the present work, in which many volumes are concentrated in one book. Had it been published a generation ago it would have been printed in large type on heavy paper and issued as a set of volumes calculated to fill a respectable shelf. Solid learning was almost sold by weight.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

At long last it has been discovered that mere bulk may count for very little. In the animal kingdom the elephant and the whale alone survive of the mammoth creatures that once ruled the earth. In a similar way the portly and extended tome is passing, as the swollen three-volume novel has gone. Space must be economized in a shrinking world. Little people once occupied big houses; now little houses are occupied by big people. The reference is to mental stature and not to physical proportions, for the potentialities of the race are wellnigh limitless. Knowledge is power only when it is used. Wise workmen choose useful tools; not a medley of them, but those that are essential. The subject matter of this book has been selected in much the same way. How? Why? What? When? Where? Not once but many times a day do these questions present themselves in conversation, in reading, in thought. On such occasions this work will be found indispensable.

In addition to the subjects already mentioned, the following pages include an Encyclopaedia of General Knowledge, a Dictionary of Dates and Events, the New Household Physician, the Popular Lawyer, a Guide to Keeping Pets, Poultry and Bees, a Practical Business Handbook, a Radio and Television Guide, a Household Cookery Book that will prove of immense service to busy women, and a Rapid-reference World History. History is no longer a dull subject. It has been released from its swaddling-bands and become a vigorous youth holding a torch to light the pathway of today and tomorrow.

Every possessor of THE NEW ILLUSTRATED UNIVERSAL REFERENCE BOOK has a mine of information at his finger-tips.

THE EDITOR.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RAPID-REFERENCE WORLD HISTORY

The Record of Mankind from the Earliest Ages to the Present Time

"Study history, it is the only true philosophy."—*Napoleon.*

I

THE GREY DAWN

IN ordinary talk, we limit the scope of history to the few thousand years during which man has left a conscious record of his thoughts and actions. Yet those years are but a few ticks of the clock compared with the immense period of time since man appeared, and through the researches of geologists and anthropologists we can, if we choose, glimpse beyond their threshold that immense grey dawn of civilization to which has been given the name, "pre-history."

Pre-history is usually divided, on a very rough reckoning not of centuries but of millenniums, into four great Glacial Ages separated by warm intervals during which man was able to establish a precarious existence on the earth. We ourselves are now living in the fourth warm interval, and according to most geologists not till towards the end of the third* (about 50,000 B.C.) are we able to form any sort of picture of human life.

The Palæolithic Age.—The Palæolithic, or Old Stone Age (sometimes called Early Stone Age) was so named because during these years man, "the tool-using animal," as Benjamin Franklin once described him, began to fashion fist-hatchets from the flints he found lying at his feet. Though unable with such weapons to wage war on mammoths and rhinoceroses, he could at least do something to protect himself, and even hunt the reindeer which, as the earth again cooled, wandered in herds over the greater part of Europe.

As the ice and snow of the Fourth Glacial Age penetrated warm valleys and spread over tropical plains, man retreated to limestone caves in the mountain-side. There his bones have been discovered, and anthropologists have reconstructed his appearance—squat, stooping, with receding forehead, broad nose and protruding jaw. Such a monstrosity to modern eyes was Neanderthal Man, so-called after that part of Germany where his skeleton was found. He probably survived as a species for some 40,000 years.

With his successor (but, according to many scientists, not his "descendant," since the types are anthropologically distinct) we arrive, in the Mesolithic Age (Middle Stone Age) at a much higher phase of human development.

The Aurignacian man of Southern France, larger and less clumsily fashioned than the Neanderthal, has his racial descendants today in Ireland, Wales, France, Spain and North Africa. He was a mighty hunter who, besides chipping chisels, hammers and scrapers to a fine edge with his flint knives, also fashioned spear-points from ivory and horn that he fixed into wooden shafts. He likewise made ivory needles with which he sewed together the skins that were his protection from the cold winds outside his cave-dwellings.

Forced to stay at home in wild weather and long wintry evenings, he learned to make pigments from mineral oxides and experimented as an artist. To this middle period belong the remarkably life-like bison paintings discovered on the roofs of the caves of Altamira in Spain by the Marquis de Sautuola (1879). Some archæologists connect these with early magic and the worship of nature spirits.

This was the Reindeer Age of Europe, when arctic conditions prevailed over the greater part of the continent, and the latter was joined to North Africa not only at either end of the Mediterranean, but where Sicily and the toe of Italy now project, forming two great lakes.

With the renewal of warmth for the fourth time, the immense ice-fields stretching north and south from the poles gradually melted, filling up the oceans and shaping continents and islands into their present form. The Mediterranean became a sea; England, which had been covered with ice as far south as the Thames, became an island; Tasmania was separated from Australia; and in North America the

* Some geologists put it back as far as the Second Glacial Age.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

glaciers as they melted left the great chain of lakes which are drained by the St. Lawrence river.

The Neolithic Age.—Climatic conditions also approximated to those we experience today, and in the course of several thousand years the earlier Stone Age civilization yielded to another far more advanced, that of the Neolithic or New Stone Age (sometimes called the Late Stone Age).

Neolithic man still made his weapons and tools of stone; but now he did not merely strike or flake his flints but ground their edges to an almost razor sharpness. He had also learned that the clumsy figures and bowls his fingers moulded from clay could be hardened by fire into pottery.

Two instincts, conflicting now as then, were at work shaping his future; one, the desire to make a home and settle, that led to the building of wattle-and-daub huts and the cultivation of field grasses such as maize and millet; the other, the nomadic call of the open that arose partly out of the search for new hunting grounds and partly, as he succeeded in domesticating cattle, sheep and dogs, out of the need for providing fresh pasturage for his livestock. With the wanderings of these early herdsmen begins the life of the Steppes which has played so large a part in world history.

Settlements belonging to Neolithic man have been found amid ancient oyster beds on the coast of Denmark. They are remains of circular wattle huts (beehive huts), their hearths made of stones built into the mud floor, close to the door by which alone light and air could make an entry.

The Swiss Lake Dwellings.—More famous are the Swiss lake dwellings, whose platforms raised on piles were first exposed by the very dry summer of 1854. From the mud beneath these piles, along with the fine-ground stone axes and implements that helped to date them, have been unearthed bone fishing hooks, pottery that had been turned on a crude wheel, wooden pitchers and bowls containing grain, primitive spinning-whorls and even some twists of flax and broken fishing-nets. They present Neolithic man to us as both fisherman and farmer, with a skilled knowledge of carpentry, since he could build houses that were almost forts and canoes that would carry him across wide stretches of lake to the shores where he grew his barley and millet.

They reveal also a facet of dawning civilization neither so praiseworthy nor so attractive as a primitive industry. Early man had fled to caves for safety from weather and wild beasts; but in a good climate, once his descendants had learned to build themselves houses, they might have been expected to choose as sites for their homes sunny plains or sheltered valleys near a river or spring. It was fear not of weather or wild animals but of fellow-men that inspired the first lake-dwellers to drive their log piles deep into the water, and so construct island sanctuaries safe from marauding bands.

Stonehenge.—Foundations of wattle or wood houses are not the only significant relics left by the people of the Late Stone Age. There are others as interesting from the questions they start us asking about their purpose, such as the arrangement of megaliths to be found at Stonehenge on Salisbury Plain, or at Carnac in Brittany.

Many have been the theories brought forward in answer, from sun-worship to Egyptian magic and chariot-racing; these help also to explain the religious beliefs of those who erected the burial mounds and stone tombs that fringe the western coast of Europe from Spain to the southern Scandinavian shores.

They are evidence at any rate that Neolithic man had advanced in his knowledge and outlook far beyond the bounds of savagery. The next stage must be not merely discoveries such as the use of metals and the construction of ships for the conquest of the sea, though these would bring him to the threshold of civilized life; but that ability to record what he had done and to measure human achievement against the background of time, which are the foundation stones of history.

II

EARLY EGYPT

The Nile Valley.—"The Valley of the Nile can tell us an unbroken story of human progress such as we can find nowhere else."

It is thus natural to begin world history with life in ancient Egypt, where the annual summer flooding of the river taught Neolithic Man his first lessons in agriculture. The rich black mud left in the fields on either side of the main stream when the waters retreated in the cool of autumn was a natural fertilizer; and where seeds of maize and millet grasses profited at first more by chance than selection, man, prompted by hunger to observation, at last began to sow the best of the grain he had found and made sure by digging channels or raising dykes that this patch of farmland would be duly manured at the next annual inundation.

Now, agriculture is one of the great civilizing influences of the world; and the Egyptian who started by thinking of food only for himself and his family soon discovered that if the mighty forces of the Nile were to be kept from mischief he must join

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with his neighbours in harnessing them. In this way homesteads raised above flood level were linked into villages and when the Nile was violent one village grew accustomed to seeking help from another, until at last provinces, or Nomes, were formed, whose chiefs directed the energies of those under their rule and received in return the earliest form of taxes, namely a settled portion of each harvest.

Finally, the whole land was divided into two very large districts, the Kingdom of Lower Egypt in the north, stretching from the Mediterranean to just below modern Cairo, and the Kingdom of Upper Egypt, whose southern frontiers were the Sudan and Nubia.

Tradition tells us that Menes, a warrior chief of Upper Egypt, succeeded in conquering Lower Egypt and made Memphis his capital, thus founding the Ist Dynasty of kings, later called "Pharaohs" (Per-o was "the Great House" or Palace of the King). His date is usually given as 3400 B.C. but Egyptian chronology presents peculiar difficulties, and up till the Imperial Age the reckonings of Egyptologists often vary by many centuries.*

The Pyramid-Builders.—It was probably during these early dynasties that copper supplanted the flints used for tools and weapons by Neolithic man; and thus made it possible to build in limestone instead of burnt mud. In the reign of King Zeser (IIIrd Dynasty) we arrive at "the first stone house that was made," according to the chronicler Manetho; for Imhotep, Zeser's chief minister and architect (afterwards deified by the Ptolomies), designed a tomb for his royal master, built in limestone platforms up to a height of nearly 200 feet. This is the famous "Step-pyramid" of Sakhara; and to understand this new fashion in architecture it is necessary to recognize the background of Egyptian thought that made possible in practice work on so grand a scale.

The pyramids are indeed the witness of Egypt's essentially religious outlook and belief in a life after death, for which it was necessary to preserve the human body from destruction, especially that of the King-god who was both their ruler and high priest. Polytheistic, for every province and even village possessed its local deities, Egyptian faith centred chiefly in the sun-god Ra; in the man-god Osiris, who was slain and lived again; in Isis, his wife; in Horus, their son; and in Set "the Evil," the enemy of Osiris and his worshippers.

After death the soul of man, even of Pharaoh, must make its perilous way, beset by demons, to the judgment seat of the Other World, where Osiris now reigned, there to be weighed in the scales against the peacock feather that was the symbol of righteousness. Because the new life was believed to be in many ways the counterpart of the old, the custom grew up of burying the dead with their favourite belongings, as well as of painting on the walls of the tombs familiar scenes of the previous earth-life, for the satisfaction of the Ka, or spirit-double.

Since Pharaoh's tomb must exceed in magnificence those of his subjects, yet prove strong enough to keep at bay the greedy curiosity of robbers, there arose the pyramid design, with its burial chamber hidden away in the heart of the mighty pile of masonry, the passages leading to it blocked and concealed by every possible device of the builder and engineer.

Nearly a century after Zeser, King Sneferu (IVth Dynasty) commanded two tombs of this type to be built, one in steps at Medum for his mummy, the other for his Ka at Dahshur, filled in with polished limestone, so that in shape it is the first of the true pyramids.

More famous still, of course, are the "Great" and second pyramids of Gizeh, the tombs of King Khufu (Cheops) and Khafra (Chephren) (IVth Dynasty).

Covering an area of thirteen acres with more than 2,300,000 blocks of limestone, each weighing some two and a half tons, the Great Pyramid would be, even today, an immense piece of work. At a date when only man-power, provided with copper or stone tools, could be employed, it seems almost incredible, whether that power represented gangs of slaves driven by overseers, or the fellahin hired during the seasons when floods prevented farming. Whichever theory is true, at any rate the work was not carelessly done. Rather, as Sir Flinders Petrie tells us, the mason's skill that cut those blocks and fitted them stone to stone was "equal to optician's work but on a scale of acres instead of inches."

The smaller of the two pyramids, that of Khafra, was connected by a causeway with the monument we call the Great Sphinx. This has been described as "the largest portrait figure ever made"; for it represents the King's head on the body of a lion, keeping watch over his tomb.

Egyptian Writing.—At this stage in history we are well over the threshold of civilization, for we need no longer make guesses as to tombs and temples, since the builders themselves have left us in pictures and hieroglyphics their own records for posterity.

At first, writing was merely a series of notches of varying size made on sun-baked mud for purposes of measurement; then

* See *Encyclopædia Britannica*: Chronology.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

came "picture-signs," designed to express a single word (such as "water" by a wavy line, or the drawing of a bee to represent an insect). Real writing, as we understand it, was developed only when ideas impossible to represent directly (such as the word "belief," for instance) came to be expressed phonetically by "pictures" denoting the same syllable in whatever word they occurred.

In the course of centuries these hieroglyphics, at first cut on stone or painted on wood, but later written with reed pens on paper made from papyrus-grass, became modified until they were entirely conventional after the manner of our own alphabet. Also, while hieroglyphics were still employed for inscriptions, two other sorts of writing were evolved, the hieratic hand used by the priests, who were often government scribes, and the demotic, or popular, that bore much the same relation to hieratic as our ordinary writing does to print.

At first, when archæologists began to take an interest in ancient Egypt they were in despair, because all around they saw a wealth of inscriptions and literature they could not read; but in 1799 some soldiers of Napoleon discovered a stone near the Rosetta mouth of the Nile, bearing the same inscription in three scripts, hieroglyphic, demotic and Greek. This served the purpose of a dictionary; and from that time we have been able to study the life of ancient Egypt through her revealing literature, not merely in her inscriptions but in her "Book of the Dead," with its guidance for the soul in the Underworld, in her treatises on medicine and science, and even in her fairy tales and stories of adventure.

III

IMPERIAL EGYPT

The Hyksos Kings.—Pyramid building continued till the VIth Dynasty; but the spirit that had inspired Khufu and Khafra did not long survive them, and both design and workmanship declined. Towards the end of this period there developed a Feudal Age, lasting several centuries, during which great nobles built up hereditary estates along the valley of the Nile and ruled there as petty kings. When they died, some of the most important were buried in tombs cut in the cliff side, whose pillared doorways still look down upon the passing river traffic.

This Feudal Age ended in bloodshed and confusion. It would seem that Egypt, hitherto protected by her deserts and the sea, had at last in her growing luxury attracted the covetous eyes of aliens. Her invaders were Hyksos chieftains (princes of the desert), coming swiftly from the east in chariots drawn by horses, up till this time unknown in the land of the Nile, where oxen and asses were the ordinary beasts of burden. Without much difficulty the Hyksos defeated the peace-loving Egyptians and established themselves as kings; but (as has happened continually in history) the more primitive civilization was soon absorbed by the more advanced.

The Hyksos ruled as closely after the manner of those they had dethroned as they could contrive, though without making any headway in the affection of their subjects. It would be natural, then, if the tradition were true that declares Joseph, the Canaanite who was sold in Egypt, to have found favour with a Pharaoh of his own Semite race, and to have been raised to the post of his chief minister.

The Imperial Dynasty. — Somewhere about 1580 B.C. there was civil war once more in Egypt; and this time a native prince, Aahmes I, succeeded in driving out the Hyksos rulers and in establishing the famous XVIIIth Dynasty, nearly all of whose Pharaohs were able, and several of them extremely interesting, personalities.

Amenhotep I not only conquered Nubia and the country between the Third and Fourth Cataracts of the Nile, but also, marching by way of Palestine, invaded Syria as far north as the Euphrates. On his return he employed the spoils he had acquired in beginning the Temple of Karnak, whose building was to take nearly 2,000 years for its completion.

One of the succeeding rulers of this dynasty, Queen Hatshepsut, though she raised an obelisk at Karnak, was more interested in a temple that she ordered to be cut in terraces and colonnades out of the mountain-side at Deir-al-Bahri, and that she dedicated to her father Ammon, the god of Thebes.

Hatshepsut has been described as "the first woman in history" and "the Queen Elizabeth of Egypt." She was certainly a great personality and, like the English queen, skilful in amassing money by peaceful means rather than through war. During her reign a fleet was fitted out which sailed down the Nile to near its mouth, crossed by a canal to the Red Sea, and afterwards explored the African coast. From "Punt," possibly Somaliland, it returned with a cargo of tropical marvels—gold, spices, ebony, apes and monkeys.

This queen was succeeded by her nephew, Thothmes III (*c.*1500 B.C.), who had indeed shared her throne during the last years of her reign, and hated her so exceedingly that, after her death, he tried to erase her name from all her monuments and inscriptions. The wealth she had so industriously

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

acquired, this "Napoleon of Egypt" spent in campaigns in the Sudan, Palestine and Syria; but he also added to the Temple of Karnak, where he caused the history of his wars and victories to be inscribed on the inner walls. He likewise set up two obelisks at Heliopolis, one of which (miscalled Cleopatra's Needle) now stands on the Thames embankment.

Another of the famous Pharaohs of this imperial line was Amenhotep III, whose mother was a princess of Mitanni, one of the leading peoples of Asia Minor; and we can read of his alliances with Syrian and Babylonian kings. International relations, it will be seen, were already a natural feature of world politics, and many stories of embassies can be found inscribed in stone or on the clay tablets that were the writing blocks of the day. They show us that Amenhotep III, the Lion-hunter, cut a considerable figure beyond the boundaries of Egypt, not unworthy indeed of the immense Memnon Colossi which he commanded to be carved as his memorial from a single block of gritstone and which still stand gazing out across the Nile.

The Heretic Pharaoh.—After his death the dynasty declined in power but not in interest, for Amenhotep III's son, the seventeen-year-old Amenhotep IV, is the "heretic Pharaoh" who, if he had not been born some centuries too early for the thought of his day, might have hastened the course of civilization.

This young prince had been brought up in the special worship of Aten, a manifestation of the light- and heat-giving power of the Sun-god, Ra, and directly he began to reign he proclaimed that Aten was alone to be worshipped, singing his praises in a hymn he had himself written, which has been called "one of the greatest poems of antiquity." In this, for the first time in the world's history as far as we know, monotheism was preached; and what was even more interesting was that the god whose praises were sung by this young Pharaoh was no jealous tyrant but the source of all beauty, life and energy, one who loved and made provision for what he had created, from man to the very birds nesting in the marshes.

Because Thebes, a Greek name for the Egyptian city of Wesi, the chief city of Imperial Egypt, was largely in the power of a priesthood devoted to the old gods and bitterly hostile to his new religion, the young Pharaoh, who had changed his name to Akhenaten (Aten is satisfied), removed his capital farther north to where the modern Tel-el-Amarna stands and began to build temples there and a palace for himself and his Queen Nefertiti. Occupied with his new faith, and disliking the wars of conquest that had been the previous amusement of his dynasty, he turned a deaf ear to the complaints of provincial governors and the demands of his father's foreign allies.

It was hardly a way to win popularity amongst his officials and nobles; and when he died before he was thirty years old, leaving no son to succeed him, the Theban priests once more seized power, brought back the seat of government to their own city, and to the best of their ability erased the name of Aten and his high priest from all monuments and inscriptions.

Akhenaten's son-in-law, the boy Tut-ankhamen, they forced to return to the old faith; and when in a few years he also died they buried him with a vast amount of magnificence and ceremony in the Valley of the Tombs of the Kings.

Rameses II.—Already before the reign of Akhenaten decay had begun to eat into the fabric of Imperial Egypt. During the XIXth Dynasty (1320-1200 B.C.) two warrior Pharaohs, Seti I and his son Rameses II, did their best to restore the old supremacy of the land of the Nile in international affairs, invading Palestine and waging frequent campaigns against the Hittites, at this time the chief power in Asia Minor.

The inscriptions of these reigns tell of many hard-fought battles, and especially of the reckless bravery of Rameses who, when cut off with his staff and a small section of his army at Kadesh, succeeded after making repeated charges in driving his chariot to safety through the enemy's lines. From the standpoint of heroism the "Day of Kadesh" was magnificent; but Egypt herself won nothing permanent from the glory of the stubborn fighting of the years that followed it. The star of other powers was indeed rising above the horizon and to their fortunes we must turn to carry on the history of the ancient East.

IV

THE EARLY EMPIRES OF THE MIDDLE EAST

The Sumerian Empire.—Another civilization contemporary with Ancient Egypt, but for geographical reasons not so homogeneous, was that of the land between the two rivers Euphrates and Tigris, to which the Greeks gave the name Mesopotamia. Here, some 5,000 years before our era, a number of small city-states existed on the Sumerian plain bordering on the Persian Gulf, which at that time ran inland nearly 130 miles beyond its present coast line.

The original home of the Sumerians is uncertain; but excavations on the site of their principal cities, Nippur, Lagash, Eridu, Ur, Larsa and Erech, reveal ways of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

life and thought already old and well established. Mesopotamia did not possess the limestone that enabled Egyptians to create imperishable monuments, but sun-baked clay was ready to her hand, and at Nippur, just south of Babylon, Sumerian workmen constructed to the orders of their priest-king a Ziggurat, or temple of bricks, in honour of their god Enlil, a building that could well have inspired the legend of the Tower of Babel. They also carved portraits of themselves and left primitive picture-signs that later developed into the wedge-shaped writing we call cuneiform.

Some idea of the brilliance and skill in craftsmanship of this Sumerian Age has been revealed by excavations at Ur, whose royal graves, belonging to a date at least 1,200 years before Abraham, yielded up not only their dead but golden crowns and combs, finely worked ornaments in cornelian and lapis-lazuli, delicate inlaid carvings, silver-hilted daggers and copper-tipped pikes.

About the year 2700 B.C. a Semitic tribe from the north, the Akkadians, conquered the cities of the plain and, absorbing the superior civilization of their subjects, founded a joint empire of Sumer-Akkad, which in its turn in time became the prey of Syrian Amorites.

Hammurabi (c. 2100 B.C.).—The Amorite capital was at Babylon, and the most distinguished ruler of the first empire of that city, Hammurabi, a contemporary of Abraham, is usually identified with the biblical Amraphel, King of Shinar.

Hammurabi was a warrior: he proclaimed himself "the king who caused the four quarters of the world to render obedience"; and after a prolonged struggle with his chief rival, Rim-Sin, King of Larsa, he certainly remained lord of the Babylonian plain. Yet he is better remembered today in world history as the first of a long line of royal lawgivers who based their authority on established justice.

Hammurabi's laws, engraved in Semitic characters on a stone eight feet high, reveal in their restrictions and prohibitions the picture of an agricultural and commercial community already so complex that it was necessary to adjudicate between landlord and tenant, employer and employed, doctor and patient, the ruler of the capital and his provincial governors. The impression of complexity is further deepened by a study of the clay-tablet letters dictated by the king to his secretary, dealing with subjects as various as sheep-shearing, floods and the adjustment of the awkward Sumerian moon calendar.

"I established law and justice in the land and promoted the welfare of the people." For this endeavour Hammurabi was remembered with affection and pride in the Land of the Two Rivers long after his death, when evil days of civil war and invasion destroyed the first empire of Babylon, and another Semitic people, the Assyrians, whose home cities were Assur and Nineveh on the Upper Tigris, began to dominate the plain.

The Assyrian Empire.—The real founder of Assyria's empire was Tiglath-Pileser III (745 B.C.), who conquered Babylon and broke down the resistance that the Syrians had hitherto maintained in northern Palestine, sacking their chief city of Damascus. This opened up an easy road by which the conquerors could march against the feeble little kingdom of Israel, and disperse its ten tribes (the "lost ten tribes"), though it was actually Sargon II (722-705) who captured Samaria and repopulated the land with Babylonians.

Sargon's son, the more famous Sennacherib (705-681 B.C.), who, in Byron's words, "came down like a wolf on the fold," failed, we know, to take Jerusalem. According to the Jewish account, "it came to pass that night that the Angel of the Lord went out and smote in the camp of the Assyrians an hundred, four score, and five thousand; and when they arose early in the morning they were all dead corpses."

In Mesopotamia "the Wolf," as he swept across the plain with his war chariots and battering rams to exact vengeance for a rebellion in Babylon, was wholly successful. The proudest city of the Euphrates was pulled stone from stone, set on fire, and her ashes strewn with salt. Afterwards a canal was diverted into her streets. Her treasures the Assyrians carried away to embellish Nineveh, which had now taken the place of Assur as the conquerors' leading city.

Amongst other spoils were thousands of clay tablets inscribed with works on religion, history, science, medicine, etc., and these afterwards became the property of Assurbanipal, grandson of Sennacherib (668-626 B.C.). It was Assurbanipal's boast that he had been brought up to read as well as to ride and use the bow. He was extremely proud of his library, and built a special room with shelves to house the tablets that thousands of years later were discovered by archæologists and brought to the British Museum.

Apart from bookish tastes Assurbanipal was as savage a ruffian as other Assyrian rulers, and rejoiced in wholesale slaughter of his enemies, and in the tortures that it was the custom of his race to inflict on prisoners of war.

Under his leadership his armies carried his empire from Tigris to Nile; but it was the domination purely of force, and strained the resources of Assyria herself so far that her collapse inevitably followed. Many had been the secret alliances formed against the tyrant in the past by Egypt, Babylon and the peoples of Asia Minor; but it was a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

final union of a Semitic race, the Chaldeans, with an Aryan, the Medes, that overthrew Nineveh (612 B.C.).

Great was the rejoicing throughout the Ancient World at the news. Save for a genius for sculpture, Assyria had been a robber people, taking from civilization and giving nothing in return. "All who are told of you clap their hands over you," exults the Jewish prophet Nahum, "for whom have you not wronged unceasingly?"

V

THE SECOND EMPIRE OF BABYLON

The Jews.—There are some countries that have been of importance in world history from earliest times, not for their size or wealth of mineral resources, but for their geographical position. This is true of Palestine, which has been described as "the bridgehead" between Egypt and the East, since on one side of her lay the desert, almost impassable for large bodies of men, and on the other the sea, by no means, in days of primitive navigation, a popular method of travel.

Across that bridgehead, after following the coast route of the Sinai peninsula, rode Thotmes III and other Pharaohs of the Imperial Age to invade Syria and the plain of the Euphrates. Down it, through the narrow pass of Mount Carmel, swept the triumphant Assyrians. Into it from beyond the Jordan poured wandering races, seeking a settled home in "a land flowing with milk and honey."

When the Jews actually arrived in their "Promised Land" is a matter of dispute between archæologists, though some hold that, if Joseph were a favourite of the Hyksos dynasty, the Exodus probably took place under their imperial successors, and Queen Hatshepsut herself may even have been the protector of the infant Moses.

Whatever the truth, we know from the biblical story that other tribes were already in possession of Palestine when the Jews arrived there, especially the Philistines in the principal coast towns; and that the newcomers had to fight strenuously for their inheritance under leaders who were at first prophets and later kings.

A shepherd-king, David, won for them at last a definite standing in the country and established their capital at Jerusalem; while during the reign of his son, Solomon, they even enjoyed a short period of commercial prosperity and peace, as allies of Pharaoh and Hiram, King of Tyre.

The Two Kingdoms.—This golden age could not last, since it was due mainly to the weakness of Egypt in the south, and the fact that in the north the Syrian Princes of Damascus were fully occupied in a life and death struggle with the rising might of Assyria. It would have been well for the Jews if they could have realized the issues at stake; but, hating their Syrian neighbours, they opposed rather than assisted them, at the same time quarrelling violently amongst themselves.

Under Solomon's son, Rehoboam, the Kingdom of David was rent in twain; and with the separatist cry, "To your tents, O Israel!" the northern tribes elected to follow king of their own, and to recognize Samaria instead of Jerusalem as their capital.

We have mentioned in the last chapter how the military rulers of Assyria, Sargon II and Sennacherib, having swept along the bridgehead with all the might of their armoured chariots and siege engines, blotted out the small Kingdom of Israel, carrying its population into exile and replanting the land with men and women of Babylonian stock.

Judah and Jerusalem put up more of a fight and, because Assyria was soon struggling for her own existence, they continued to maintain a shadowy independence until a new and more formidable foe appeared from the north. This was Nebuchadnezzar the Chaldean, whose father, Nabopolassar, as ally of the Medes, had helped to take Nineveh, and then established another empire in the Land of the Two Rivers, with its capital at Babylon.

Of course, even in the ancient world a great empire could not be shaken to its foundations without upsetting international equilibrium. Every power that had ever professed friendship for, or been ground under the heel of, Assyria believed the moment had now come to assert its own ambitions.

Thus Pharaoh Necho (XXVIth Dynasty: 609-594 B.C.), seeing himself as a Thotmes III, collected his chariots and horsemen and rode swiftly up the Maritime Plain, to try conclusions with the upstart Chaldeans. In a moment of lunacy the Jewish forces under King Josiah tried to block his path and were brushed aside like flies. On he pushed until it seemed for a while as if the military glory that had belonged to the Kingdom of the Nile Valley might be about to return, but the decisive battle fought at Carchemish (604 B.C.) forced Necho to retreat, so soundly beaten that we are told "the King of Egypt came not any more out of his own land; for the King of Babylon had taken from the River of Egypt unto the River Euphrates all that pertained to the King of Egypt."

The Captivity in Babylon.—In Nebuchadnezzar's eyes this included the tiny kingdom of the Jews; and so he brought his chariots and battering-rams, broke down the wall of Jerusalem, blinded its ruler,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Zedekiah, slew the latter's sons and carried off captive to his own land its principal inhabitants. These included builders, carpenters and artificers, for the Chaldean King was engaged in rebuilding Babylon with wide stone-paved streets, hanging gardens and magnificent temples and palaces.

"By the waters of Babylon" the exiles languished until, in the reign of Belshazzar, one of Nebuchadnezzar's successors, Cyrus, King of the Medes and Persians, came up against Babylon and took it (539 B.C.), afterwards allowing those of the captive Jews who wished to do so to return to their own land and rebuild the Temple of their God at Jerusalem.

This was an important event in the ancient world, in which the influence of the Jews seems to have been in inverse proportion to their material position and wealth. Their political capital destroyed, their religious sanctuary defiled and its sacred vessels carried away, they had not lost faith in the God of their fathers, but emerged, from circumstances that had spelt the extinction of other races, so imbued by the teaching of their prophets with patriotism and a belief in their own divine destiny, that they became one of the great forces of all future history.

Mr. H. G. Wells has seen in this the first great example of "the power of the written word"; since it was during the exile in Babylon that the Jewish scriptures, built up on their own traditions, though influenced by Babylonian and Egyptian legends, began to take their present shape: scriptures that became the link between Jews scattered all over the Orient.

Out of their prophecies developed a belief in the coming of a Messiah; and when the Christ appeared it was to found a new era in the history of the greater part of the civilized world.

VI

ANCIENT INDIA AND CHINA

The Aryan Tribes.—The early peoples of Asia with whose fortunes we have dealt up till now have been, with the possible exception of the Sumerians, of Semitic stock. The final downfall of Babylon brings us face to face with a new force in ancient history, the Aryans, moving not from the east, north and westwards but from Europe into Asia by way of the Caucasus.

Now the word "Aryan" is linguistic rather than racial, and implies men and women using a speech whose words have a root affinity, such, for example, as the word for "father" that can be seen to have a close connection with the German *vater*, Latin *pater*, French *père*, Persian *pidar*, Sanscrit *pitri*.

A section of these Aryan-speaking nomads, having rested for a time in north Persia and Afghanistan, made its way finally in waves of immigration through the passes of the Hindu-Kush and arrived in the fertile plain of the Indus (*c.* 2400-1500 B.C.).

Here it is probable they found and destroyed an earlier civilization which, from remains lately excavated at Mahenjo-Daro and Harappa, must have been contemporary with and shared many of the characteristics of that of the Sumerians. While some of these fair-skinned invaders settled by the Indus, others pushed on to the valley of the Ganges and Central India, driving the indigenous, dark Dravidians they found in possession back before them into the triangular peak of the peninsula and the island of Ceylon, where some of their descendants exist today.

Many of the Dravidians were still at the neolithic stage of pre-civilization, but their conquerors (as their collection of sacred hymns, or folk-tales, the Rigveda, tells us) already possessed chariots and horses, metal suits of armour and weapons; and, though their chief wealth was in cattle, yet they employed skilled craftsmen such as carpenters and goldsmiths.

They were led by chiefs and possessed an hereditary priest-class, the Brahmins; but it was not till several centuries had passed that such divisions hardened into castes, or that the women, who had freely shared the control of the household with their husbands, were shut off behind the purdah.

Restrictions arose from the desire to preserve the purity of the race, and when a man sinned against the code of his caste, whether he belonged to the Kashatryas (nobles), Brahmins (priests), Varsyas (traders) or Sudras (labourers), he and his descendants did not sink to a lower grade but lost caste altogether and became pariahs.

If India had been more accessible to external influence it is probable that her civilization would not have set in the mould that still defines so straitly the destiny of a large part of her population. One attempt at least to free it was made early in her history by her prophet, Gautama Buddha, when he preached that, just as all streams mingle their waters in the sacred Ganges, so should men when they became his disciples cease to be bound by the fetters of caste.

Gautama Buddha (*c.* 560 B.C.). — Siddhatta Gautama, when still a young man, left his life of luxury as a noble to wander through India, attempting to solve the problems of human suffering, poverty and sin which have haunted the human mind and conscience since real civilization began.

After rejecting asceticism as by itself incomplete, and meditating for days and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nights under the "Bo" tree (tree of enlightenment), the seeker at last found his solution, and began to preach spiritual regeneration through the cessation of desire. Let man free himself from all personal ambitions, sensual cravings, and even the hope of immortality, and he would find Nirvana, or true peace of mind.

By the disciples who gathered round him, and later by those who carried his teaching through not only India but Burma and China, Siddhatta Gautama was hailed as Buddha (the Enlightened One), and under this title he is numbered amongst the world's great prophets.

In India itself the religion that in the days of its founder "had no temples, no sacred order of priests and no theology, strictly speaking" struggled for some centuries with orthodox Brahminism, and for a while under Asoka, who ruled the greater part of India from Pataliputra (modern Patna), dominated the peninsula.

Asoka (264-228 B.C.).—Asoka, a grandson of Chandragupta (a military adventurer who had wrested the northern provinces of India from Alexander the Great's Seleucid successors*), began his own career as a soldier but, hating the destruction and suffering caused by war, came under Buddhist influence and spent the rest of his reign in spreading the doctrines of his Master. In his days India was called "the land of the monasteries" because of the number of its monks who, besides acting as missionaries, were encouraged by their royal master in social work, digging wells and planting trees along the hot, dusty roads they travelled, as well as in giving medical aid to the sick.

But Brahminism had by this time made so deep an impress on the hearts and minds of Indians that Asoka's struggle against the caste system lost ground after his death. In the end, if Buddhism did not die out, it yielded first place again in India to the orthodox religion, though it is still predominant in Ceylon, Burma and Tibet. Yet in all these places, in the elaboration of the theology and ritual, it has grown far away from the simplicity of the Buddha's original message.

Ancient China.—One place to which the Buddhist missionaries carried the teaching of "the Enlightened One" with conspicuous success was through the Tibetan passes to China: but here also we find native philosophers had already attempted to find answers to the great moral problems that face humanity.

The earliest Chinese civilization on which history sheds light was developed along the banks of the Hwang-Ho (Yellow River), spreading southwards in the course of centuries to include that of the Yangtze valley.

Here overlords and feudal vassals carried on a struggle for supremacy during a "dark age," when two great leaders of thought, standing far aloof from the predatory statesmanship of their day, held up a lamp of ideals that was to shine down the ages of Chinese life into our own times.

One of these was Kung-fu-Tse (Confucius, "the Master") (550-478 B.C.) who, declaring himself "a transmitter, not a maker," collected in verse and history the teaching of all Chinese civilization before his day, and instructed his disciples that through studying these classics they could alone learn how to lead cultured, and therefore profitable, lives.

This "way of right conduct" taught a man, amongst other things, to respect the past and his ancestors, and laid emphasis on the sacred character of a ruler's office and the duty of civil obedience. On its moral side it laid stress on that "golden rule" so closely approaching one of the fundamental commandments of Christianity, "do not do to others what you would not wish them to do to you."

Another Chinese philosopher of this date, Lao Tse (Lao, "the Master") (*b.* 604 B.C.) advocated "frugality, simplicity and the joys of peasant life in contact with the soil." The influence of his teaching is said to have produced the contentment that has been so marked a characteristic of the Chinese, in contrast with the restless striving of the peoples of the West.

The First Chinese Emperor.—About the third century B.C., a feudal lord, Duke Ch'in, made himself master of China and assumed the title of First Emperor or Shi-Hwang Ti (221-210 B.C.).

He is famous today for having begun the Great Wall in order to prevent the Huns from overrunning his land: infamous to some minds for having attempted to destroy all the books written before his day except those on agriculture and medicine. His special hatred was directed towards the writings of Confucius, on the grounds that they had taught loyalty to a political system that he himself had overthrown. His vandalism met with considerable success, since Chinese books were mostly made of bamboo, which booklovers found hard to hide and their despoilers easy to burn.

The characters were pictorial, laid on in colours with a pen; later, silk paper replaced bamboo. Numberless copies were soon made of the few classics that had somehow survived the First Emperor's holocaust.

This Duke Ch'in has been called China's Napoleon, and it is fitting—in spite of his crimes, and they are many, for he destroyed even more enemies than books—that the land he in some measure rescued from anarchy should have adopted his name.

* See Chapter XIII.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

VII

THE MEDES AND PERSIANS

The Medes.—From the Far East we must return to an Aryan tribe, the Medes, whom we have already mentioned as allies of the Chaldeans in bringing about the downfall of the Assyrians.

These Medes, with a kindred people, the Persians, had appeared in Asia from the north somewhere about 2000 B.C., only instead of pushing on towards Afghanistan and India they had settled in the uplands and mountain districts to the east of the Mesopotamian plain. In the more fertile valleys they followed agriculture; on the hillsides they pastured their sheep; and, just about the time the Jews were carried captive to Babylon, their prophet, Zoroaster (*c.* 660-583 B.C.), founded a religion still living today, though its adherents are few.

Zoroaster taught the doctrine of the constant struggle of good and evil, ending in the final triumph of Ahura Mazda (Ormuzd), "the Lord of Great Knowledge," over Ahriman, "the Prince of Darkness." Fire and light were to him the symbols of righteousness, and came to play so large a part in later Zoroastrianism that the Indian Parsees, who belong to this faith, are often incorrectly described as fire-worshippers.

Cyrus the Persian (*d.* 528 B.C.).—About fifty years after the fall of Nineveh, the Persians, who up till this time had been less important than the Medes, found a great general in Cyrus, one of their princes, and under his leadership not only subdued the Medes but began to make themselves masters of the Mesopotamian plain.

Some years before Cyrus captured Babylon he had been fighting in the heart of Asia Minor. Up till this time, though there had been fairly constant warfare in the border districts of Asia Minor between Anatolian tribes such as the Mitanni and Hittites and rulers of Egypt, Nineveh and Damascus, yet Egyptians and Semites alike had refrained, save for an occasional raid, from actually invading the peninsula.

It has been said that their races, desert bred, experienced a natural repugnance for climbing the "snow-streaked wall" of the Taurus range; and certainly most rulers of early empires preferred to turn their chariots south-west or east along the curve of the "Fertile Crescent," as the semicircle round the desert formed by Egypt, Palestine and Mesopotamia has been called.

The Medes, mountaineers themselves, possessed no fear of northern snows; moreover, their position enabled them to avoid the Taurus passes, and thus we find them negotiating "a scientific frontier" on the Halys river with the Lydians, at that time still the dominant power in Asia Minor.

Lydia.—So commercially prosperous was the empire of Lydia, to whose talent for finance we owe the invention of stamped coins instead of rings or clumsy bars of metal, that the name of her last king, Crœsus (560-546 B.C.), has remained a symbol of wealth. A power in the Ægean Sea as well as on the mainland, Crœsus had succeeded in conquering the hitherto independent Greek colonies of Ephesus and Miletus and allied himself with the republic of Sparta in Greece.

According to the historian Herodotus, a native of Halicarnassus, one of the Greek towns of Anatolia, he sent to consult the Delphic Oracle on the wisdom of attacking the Persians; and, having received the answer that to do so would be to witness the destruction of an empire, chose the interpretation that fitted in with his own hopes and, against the advice of more cautious counsellors, immediately embarked on the invasion of Cappadocia.

The oracle spoke truly, if ambiguously. An empire was destroyed, but it was that of Lydia, whose capital of Sardis was stormed by the Persians in 546 B.C. This was the work of Cyrus, a military genius beloved also as a man by his hardy mountaineers. When he had also captured Babylon, Cyrus ruled over a kingdom which stretched from Syria to the Ægean, and from the Armenian uplands to the Persian Gulf.

Darius the Great.—Cambyses, son of Cyrus, carried on his father's work of empire-building by adding Egypt (525 B.C.) to the dominions he had inherited; but his reign was a short one, and it was under his successor, Darius (521-485 B.C.), that the ancient world held an empire which exceeded in extent and carefully planned government anything its rulers had yet imagined.

The old Median capital had been Ecbatana, but the Persian city of Susa now became the centre of a network of roads, along which royal messengers rode, continually carrying the will of the Great King from his residence to the provincial governors or Satraps.

The international language of the world's earliest empires was, we know from clay tablets dug up at Akhenaten's capital of Tel-el-Amarna, Babylonian; and partly from this the Persians evolved a script of their own with thirty-nine cuneiform signs. Like hieroglyphics in Egypt, this script continued in use for inscriptions, but proving altogether too slow and clumsy for the daily round of official communications, Aramaic took its place for ordinary use. This had been first introduced, written in ink on parchment or papyrus, by Syrian merchants travelling through Mesopotamia, and also by clerks of their race employed in the business houses of Nineveh and Babylon.

Just the same thing happened in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Palestine, where Hebrew was superseded for ordinary use by Aramaic, the language of Jesus and all His disciples, in which His sayings were in all probability first recorded.

It is to the reign of Darius that we owe the famous Behistun monument, sometimes called the Rosetta Stone of Asia because this proclamation of the Great King's triumphs is inscribed in three types of cuneiform, Babylonian, Persian and the local language of Susa. "By the grace of Ahura Mazda," it runs, "these lands had conformed to my decree. Even as I commanded so was it done."

No ruler of the ancient world had ever before exercised so great a power—or, it might be said from the modern viewpoint, with the possible exception of Hammurabi, so intelligently. Where Assyrian conquest inevitably left a trail of massacre and ruin, the Persian established satrapies under governors responsible to the king. Taxes were paid sometimes in gold but often in kind, the army drew its quota of recruits, but on the whole—while the Great King himself was alive—without undue extortion or hardship.

One thing novel in a Mesopotamian monarch was the interest Darius took in the sea. Hitherto, the empires with which we have been dealing had been great land powers; but now the Persians not only looked on the gulf we have called after their name but—by the overthrow of Lydia—out across the Mediterranean.

With regard to the Persian Gulf, Darius gave a Greek sailor called Scylax a commission to explore the coast of Asia towards India and down towards the Isthmus of Suez on the west. In the case of the Mediterranean, he took into his employment that seafaring folk, the Phœnicians, formerly under Egypt. Also, through his conquest of Asia Minor, he was brought in contact with the trading colonies that Greece had by this time planted along the shores of Anatolia. In attempting to exercise the same control over their affairs he adopted elsewhere in his empire, he was met by a most determined opposition. To understand whence this arose, and Darius's failure to enforce his will on the Greeks, we must go back many centuries to the dawn of civilization in the Ægean.

VIII

EARLY ÆGEAN CIVILIZATION

Importance of the Mediterranean.—Europe, in the same way as Egypt and Mesopotamia, passed through the palæolithic and neolithic stages of pre-history. With regard to the latter we have already mentioned the remains of Danish beehive huts and Swiss lake dwellings, and would draw attention also to the high level of Late Stone Age culture recently revealed along the valleys of the Danube and Rhine.

At length, however, stone yielded place for weapons and tools to the more easily worked and less brittle copper; and, still more important, to that alloy of copper and tin that gave its name to the Bronze Age (*c.* 2000 B.C.).

Another thousand years, and the iron, which had been here and there smelted and beaten into tools and ornaments, came into general use, ensuring victory for those who used it in making their weapons against spears and swords of softer and more malleable metal.

By this time, the threshold of recognized history had been long passed; but in studying the footsteps of those who have barely crossed this lintel we cannot but be struck by the extreme importance of the Mediterranean to early European progress.

Many minds instantly conjure out of the word "sea" the picture of a barrier between continent and continent, and to them the Mediterranean is primarily a stretch of water separating southern Europe from Africa and Asia. While true, it is not from the point of view of the ancient world the most vital aspect of the "Middle of the Earth," as classical writers named the central factor of their common fortunes.

At first, of course, when shipbuilding was in its infancy and compasses non-existent, the Mediterranean had its terrors. Mariners hugged the coastline, putting into harbour at dusk, and if wind or trade forced them to cross the open sea they looked round eagerly for some island to use as a stepping-stone to their final port of call.

Crete.—One of these regular stepping-stones of ancient times was the island of Crete, of whose civilization we know a considerable amount owing to the excavations at Knossos, its chief town, though little that is definite about its history, since neither its picture-signs nor yet the linear script inscribed on clay tablets stored away in sealed coffers can be deciphered.

Legend tells us that in very early times the Cretan Minotaur yearly devoured a tribute of foreign youths and maidens; a story culminating in the escape of the Greek hero, Theseus, from a prison labyrinth, after he had slain the great bull-monster. Excavations at Knossos reveal the many-dungeoned palace of a king-priest, whose title was in all probability Minos, and sacred symbol most certainly the labyros or double-axe.

From the frescoes on the walls it is clear the national sport was a species of bull-baiting by naked toreadors of either sex, whose sole hope of life lay in successfully catching the bull by the horns and swinging themselves clear of danger. It can well be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

imagined that an enforced tribute would be required to maintain the ranks of bull-fighters at full strength.

Yet the Cretans, if lovers of this cruel pastime, were not a savage people rejoicing in war after the manner of the Assyrians. Their chief town had practically no fortifications, and the life so far exposed points to a very high level of material civilization based on commerce rather than pillage. Since Crete is an island, this implies trade with other Mediterranean powers, and, because of its position as a "half-way house between three continents" and the maritime genius of the race, the name "Sea Kings of Crete" has been bestowed on its rulers.

Foreign merchants, the "Keftu" from "the Isles of the Green Sea," are pictured in the frescoes of the XVIIIth Dynasty of Egypt, carrying ingots of copper and large vessels; and they have been identified from their dress and features with the Minoans of those days. That this is likely to be true we can tell from Cretan objects found in Egyptian tombs, and manufactures from the Valley of the Nile dug up in Knossos and Phaistos. Trade there was between Egypt and Crete; but still more, dating back to a remote age, between the "Sea Kings" and the inhabitants of the mainland later called Greece.

Greece in the Heroic Age.—Excavations at Mycenæ and certain other towns have in fact revealed a strong Minoan influence at work at a time when the Greek tribes, such as the Dorians, could not yet have descended through the mountain passes of Macedonia into the southern part of the peninsula. About the people who then inhabited the land there is considerable dispute, especially in answering the question whether this early culture found at Mycenæ, Tiryns, Orchomenos and Thebes is the same as that of the "Homeric Age" described in the *Iliad*.

Schliemann, the archæologist, who first began the unfolding of this pre-hellenic civilization, was certain that it was, and even believed that he had discovered the actual tomb of Agamemnon, King of Mycenæ, but later opinion finds many vital differences between the customs of the Mycenæan Age and those described in the *Iliad*. It seems more likely in fact that, as in the case of other civilizations long-enduring and yet always changing, the Homeric poem may describe the closing stages of a bronze epoch whose earlier glories the spade of the excavator is now bringing to light.

The background to such glory is always Crete, which inspired Mycenæ's earliest art, and was still an influence in the days when Agamemnon sailed for Asia Minor and "the ringing plains of windy Troy." But "Broad Knossos" was reluctant to give help to the Mycenæans, and was secretly hated and envied by the mainland cities.

It must have been about 1600 B.C. that Minoan culture, looking back on more than a thousand years of ever-ripening civilization, reached its zenith: and some two centuries later that it suffered eclipse, though at whose hands we do not know; but the blackened ruins of once luxurious palaces and absence of all precious metals speak eloquently of fire and spoliation.

Herodotus declares that the Minoans refused to help Agamemnon against Troy; but, apart from the grudge and desire for revenge this would leave, there was as yet in ancient times no international code of "live and let live" upon the high seas. Piracy was a recognized means of livelihood, as a study of the *Odyssey* reveals; and if it was not Greeks who ruined Knossos, it may have been the Phœnicians, that Semitic sea-folk who replaced the Cretans as the chief trading power of the ancient world.

The Phœnicians.—Phœnicia itself, a narrow strip of seaboard in Palestine, shut off from its neighbours by the Mountains of Lebanon, was a site that, if it discouraged the agriculture and pasturage pursued by the Jews, offered to the more adventurous souls of the race just the right sort of timber for making ships. By means of Phœnician labour and enterprise were built not only ships but the famous seaports of Tyre and Sidon, into whose markets poured the spices, ivory, gems, perfumes and incense of the East, and the olive oil, pottery, hides, corn, tin and amber of the West.

If we no longer regard them as originators, these earliest forerunners of the modern commercial traveller must still arouse our admiration and interest. At a time when science barely entered into navigation and the Western Mediterranean loomed as threatening to Ægean mariners as the Atlantic to Columbus, these dark-bearded Semites planted their trading stations along the Black Sea and the North African coast; left a colony at Gades (Cadiz); swept through the Pillars of Hercules (Gibraltar) northwards to the "islands of the Cassiterides" (possibly the Scillies) in search of tin, or southwards along the African coast.

The hero of one of these last expeditions was the Phœnician Hanno (520 B.C.), who seems to have penetrated as far as Libya; but, if Herodotus is to be believed, even more enterprising explorers of this race had doubled the Cape and rounded the African continent in a three-year voyage nearly a century before, at the bidding of their overlord, Pharaoh Necho (XXVIth Dynasty, 612 B.C.).

Besides their actual goods for barter, Phœnician traders carried with them the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

art and civilization they had acquired. Thus the Greeks added Aphrodite (Astarte) to their pantheon and, along with pens, ink and paper (papyrus), adapted the Phœnician alphabet, a possible source of the alphabet used in the western world today. Our own word "bible" can be traced through the Greek for book to Byblos, one of the Phœnician towns.

In the fifteenth century B.C. the Phœnician seaboard, though under vassalage to Egypt, had reached the height of its prosperity. Later, Sidon, whose merchants had established colonies in Cyprus and Rhodes, was captured by the Philistines, that strange people (persistent enemies of their rival settlers, the Jews), in whom some archæologists would find descendants of the Minoans scattered by the overthrow of Knossos. According to this theory it would be the Philistines who gave the Phœnicians their original alphabet, descended from that Minoan script we can now no longer read.

IX

ATHENS AND SPARTA

Barbarian Invasions of Greece.—Between 2000 and 1500 B.C. occurred the Barbarian invasions of Greece, whose numerous mountain ridges and jutting headlands encouraged the formation, not of a centralized empire, but of separate small communities.

Hellenes, Thessalians, Bœotians, Dorians and Achæans, descending from the north by way of Macedonia with their families and their herds of sheep and cattle, established themselves in pastoral villages that in time, through growth of population and stress of hunger, became agricultural centres, their chiefs being elevated according to the tradition of the country they had conquered to the rank of petty kings.

Bands of the more adventurous, pushing their way along the eastern valleys, crossed the Straits of Bosphorus and established similar settlements on the Anatolian coasts of the Black Sea and Mediterranean; indeed, it may have been that, owing to some such wave of immigration, the actual siege of Troy took place, which later Grecian patriotism enshrined in that most famous of all epic poems, the *Iliad*.

In Greece itself the new settler, shepherd by hereditary instinct and agriculturist from necessity, at first viewed the sea with a landsman's hostile discomfort. He was quite content that Phœnician traders should bring him the oriental luxuries his dawning love of beauty coveted, and carry off in exchange his surplus olive oil, wool or crude pottery, a state of things which endured until it became obvious that each community must either face perpetual revolution or find fresh outlets for the energies of its ever-increasing number of citizens.

By this time, however, the shepherd and agriculturalist had also turned fisherman along the neighbouring coasts, and thus the way was paved towards a big colonizing movement that peopled the islands and mainland harbours of the Ægean and then established settlements along the shores of the Black Sea, Asia Minor, North Africa, Spain, Italy and Sicily.

A few of these were mere trading stations, but many developed into the replica of their home community from its "acropolis," or citadel, crowning the most dominant site, to the market place with the townsfolk's houses grouped round it and the farmlands beyond. Between the mother-city and colony the closest relations were maintained, so that it seemed inevitable, when the Greeks finally developed their genius for trade and shipbuilding, that a great Hellenic Empire would develop also, with the Mediterranean as its main street.

That this empire did not materialize, or only in part, was due to a defect in the character of the Greek. Patriotic beyond any modern conception of that word where provincial rights or needs were at stake, he could not widen his outlook sufficiently to conceive a finer patriotism due to Greece herself.

Four city-states, Argos, Sparta, Thebes and Athens, had emerged from the original warring villages; and these in their turn submitted reluctantly to a final division of the peninsula into the Peloponnesus under Spartan influence, and Attica controlled by Athens. The deep-seated rivalry and fundamental opposition of ideals of these two states forbade any further fusion, and indeed form the political *motif* of Greek history, until the rest of the peninsula was conquered by the Macedonians whom it despised.

Sparta.—The Spartans, or Lacedæmonians, had kept their Doric ancestry almost pure by segregating Spartiates from the rest of the population, of whom the greater part were helots, or slaves condemned to till the fields and produce food and clothing for their masters.

It could not, however, be brought up against the Spartans that they idled in luxury. They were born to a life of perpetual physical training on the barrack-square. Children who at birth did not come up to the standard expected were exposed on some hillside until they died of cold and want. At seven the male survivors of this drastic selection were taken from their mothers and educated by public teachers, whose main lessons were in courage and self-control.

Everyone knows the story of the Spartan

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

boy who preferred to be bitten by the fox-cub concealed beneath his cloak than admit he had been so silly as to be caught stealing. It is worth repeating for the light it sheds on this brave, simple, physically perfect but profoundly stupid people; so content with the rut in which they moved that they could not believe there was any superior view to be obtained from the heights beyond.

As might be expected, such a system of life commended itself to the government of a few rather than of the many, and Sparta was ruled by an oligarchy, with two kings for its figureheads controlled by magistrates called Ephors. During the internecine struggles waged in early Greece the aristocratic party in other cities could often rely on secret Lacedæmonian support; and up to the battle of Marathon Sparta was regarded as the chief military power in the peninsula. It was with Sparta that King Crœsus of Lydia naturally allied himself when looking for help against Persia in the Ægean.

Athens.—Athens was a very different proposition. Here in Attica conquerors and conquered had mingled to produce a population of whom a modern English eugenist has said, "the average ability of the Athenian race is, on the lowest possible estimate, very nearly two grades higher than our own; that is, about as much as our race is above the African negro."

Such a judgment does not rest on the material riches of this civilization, for in early Attica the general poverty, had it not been tempered by climate, would deserve our adjective "grinding." Houses were mud hovels, draughty and without light in winter, airless in summer. Sanitation was nil—no sign here that the sewage system of Cretan Knossos had influenced mainland susceptibilities. The provision of sufficient food, dependent on local harvests, was a yearly anxiety. Society had its leaders, but they were little better off for homes, furniture, food and clothing than the ordinary citizen.

On what then did the basic superiority of Athens rest? It would be easy to sum it up in the word "culture"; but this again needs explanation in terms of that innate love of beauty, energy and awareness of life that made classical Athens, like the Italy of a later Renaissance, seem the dawn of golden possibilities for the human race. There has always been energy in the affairs of this world, but it is usually fevered and distracted. Athens harnessed hers to the ideal of harmony; that ideal, her sculpture and literature show us, had nothing in common with anæmic compromise.

Politically Athens passed through the same stages of misgovernment as her neighbours. In very early times she suffered from the oppression of kings and nobles whom the Bœotian farmer-poet, Hesiod (seventh century B.C.), described as "bribe-swallowing lords." Even her increasing trade did not at first improve conditions, for with the adoption of the Lydian coinage it became a practice for farmers who were better off to lend money to neighbours in difficulties, and then after the next bad harvest to sell them up. Judges proved corrupt, and the advantage gained when Draco codified the hitherto unwritten laws was lost through the severity of the sentences he suggested. For nearly all crimes there was the same penalty, death.

At last a great statesman arose in Athens. This was Solon (594 B.C.) who, when he was made Archon, or chief magistrate, declared that to free the peasant from his overwhelming burden of debt all mortgages must be cancelled, and those who had been enslaved for not paying what they owed set free.

Solon also set a limit to the amount of land a man might in future acquire, gave a right to sit in the Assembly to all free citizens, and insisted that there should be the same justice for rich and poor in the public law courts.

The foundations were thus laid for Athenian democracy; but first the city, like so many of her neighbours, passed through the stage of government by tyrants. The word tyranny implied the absolutism we connect with it today, but not necessarily evil government. Some tyrants of classical times were nobles who had begun their careers by agitating on behalf of the oppressed classes; and when they rose to power used it to protect the poor and improve their cities.

Pisistratus, Tyrant of Athens from 560-527 B.C., lent money to the peasants to buy back the farms they had mortgaged, encouraged commerce, built a fleet with which he seized the mouth of the Hellespont, and was patron of a new architecture in limestone and marble instead of mud bricks.

The defect of absolutism is its lack of any guarantees. The sons of Pisistratus were less able and conscientious for the public welfare. Tyranny became unpopular and, in 511, Hippias, the last of the Athenian Tyrants, was driven into exile. In order to protect the city in future from individual ambition, one of the nobles, Cleisthenes, introduced a law allowing citizens to exile every year, for a period of ten years, any one person they considered a danger to the state. At least 6,000 adverse votes must be cast to secure this ostracism, so called from the ostrakon, or shard of pottery on which the vote was recorded.

Up till now we have dealt with home problems, but soon after the fall of her tyrants Athens found herself forced to solve

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

030/32 24286
Digitized by Arya Samaj Foundation Chennai and eGangotri

others that began outside her own boundaries. Political isolation was nearly as difficult to achieve, and as fatal to those who pursued it, in the ancient world as in the modern.

X

GREECE AND PERSIA

The Grecian Heritage.—The ancient Greek was by nature an individualist. His character tended to encourage the separatist tendencies bred of geographical conditions and tribal origin. Yet certain factors were in the field making towards unity by assuring the Greek that he was not only a citizen of Argos, Corinth, Athens or Sparta as the case might be, but something more, a "Hellene," inheritor of a common language, culture and traditions, that raised him in his own eyes far above "barbarian" level.

The *Iliad* has been called "the Greek bible." This, and the *Odyssey* (adventures of Ulysses), as well as numerous songs and poems concerning the gods of Olympus and their relations with mortals, though really the compilations of centuries, were at one time all attributed to the authorship of Homer; and the blind bard who had recited them from court to court became a national possession of all Greeks, somewhat as Shakespeare is of all the English-speaking peoples today.

As time passed, the primitive conception of divinity portrayed in the old epics changed. The gods remained the same in name, Zeus, Hera, Athena, Artemis, etc., but instead of being similar to men and women, with weaknesses and vices though magnified, they were now regarded as moral beings, enjoining on their worshippers a code of right conduct. Apollo, speaking through his Oracle at Delphi, preached the self-control loved of Sparta and the harmony that was the ideal of Athens. Before his altar, seeking answers, it might be, to individual problems, but as often a settlement of disputes between city-states, came ambassadors from all parts of the peninsula. "Know thyself" was the stern motto inscribed on the marble slab above the door; and the general reverence with which the prophetic answers to petitions was received was another binding force upon all the devout in Hellas.

Yet a third bond, also of a religious nature, but characteristically Greek, were the Olympic Games held every four years and celebrated in verse by the greatest poets of the day, such as Pindar (522-448 B.C.), the lyricist of Thebes. The Games included boxing, wrestling, spear-throwing, races on foot and in chariots, some of the latter being entered from colonies as far distant as Syracuse. The most coveted award was a laurel from Apollo's sacred grove; and the winners, on their return home, would receive an ovation from their fellow citizens, ready even to make a new gateway in their walls to do their champion special honour.

The first of these Games was held in 776 B.C., the date from which, before the discoveries of archæologists such as Schliemann and Sir Arthur Evans, it used to be assumed that Greek history began.

This mutual inheritance of culture and religion was not restricted to the peninsula but shared by all the Greek city-states from the coast of Spain to Asia Minor. In the West the most important of these colonies at an early date were Tarentum and, later, Neapolis (Naples) in southern Italy, and Syracuse in Sicily. So powerful and independent did they become that this part of the world was often called Great Greece. In the eastern Mediterranean the Ionian colonies, Miletus, Ephesus and Phocæa, became the leaders of the Ægean not only in trade and luxury but in learning.

Thales of Miletus (585 B.C.) was a scientist and mathematician, who, having studied Chaldean astronomical works, was able to foretell eclipses. What is more interesting is that in the modern manner he began to draw deductions from facts he had actually verified, and declared that the heavenly bodies must move according to fixed laws. This made him realize something of the immense age of the universe and the impossibility of its creation by gods who were supposed to have inhabited Thessaly only a few generations before his own time.

Other learned men of Miletus were Hecatæus (517 B.C.), traveller and geographer, who drew a circular map of the world with the ocean-stream running round it; and Pythagoras (532 B.C.), a mathematician and philosopher who believed in the transmigration of souls, and worked out a theory of numbers to which he traced back "the principles of all existing things."

Unfortunately the Ionian bloom of Greek culture was roughly plucked while yet in flower. The colonies on the mainland of Asia were forced by their position to acknowledge the supremacy first of Lydia, and then of Lydia's conqueror, Persia. King Darius did not prove a harsh overlord, but any chain will irk those used to freedom, and so the Ionian colonies rebelled. They asked Greece for help, and Athens replied by sending twenty ships and with this aid the rebels stormed Sardis and reduced it to ashes.

The Persian Wars.—From this conflagration dates the beginning of war between Greece and Persia, since Darius, already goaded by failure to avenge the inroads of Scythians and Cimmerians from the Balkans

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(modern Bulgaria), was in no mind to receive tamely this fresh insult from Europe.

Gathering an immense army at Susa, and ordering the Phœnician fleet from Tyre and Sidon, which had become his vassal cities, to be ready to give him transport, the "Great King" set out to conquer a new world. "Remember the Athenians" were said to be the first words he uttered every morning; and when the report of his fury was brought to Greece, and the tale of how Miletus had been stormed and sacked, the little republic trembled.

Now was the time, it was felt, to test Hellenic unity, and for Lacedæmonians to show the worth of their military training; so messengers were sent to Sparta to ask for immediate help against the Persians, while the Athenians themselves collected what armed citizens they could muster and set out to bar the Great King's advance upon their city.

When the two armies met on the plain of Marathon (490 B.C.), some twenty-five miles from Athens, the only Greek ally present was a contingent from the little town of Platæa, and the Persians must have outnumbered their combined enemies by two to one. This battle, one of the most important in world history, has been described as a contest "between Grecian spears and Persian arrows." That the former triumphed was due partly to Miltiades, the Greek general, partly to the tenacious courage of citizens fighting for their homes against half-hearted mercenaries in a foreign land. Its issue proved two things. First that the Persian empire, representing the might of Asia, was not invincible, and next that Sparta, whose forces arrived too late to share in the fighting, had by what has been called her "great refusal" abdicated the position of military leadership in the Greek world.

The Persian menace, however, was not yet at an end. Xerxes (485-465 B.C.), the successor of Darius, was more determined than ever to wipe out in Athenian blood the impudence which had challenged his sovereignty. With an even larger army, and the Phœnician fleet gathered to meet him at the Hellespont, he set out to see vengeance exacted in full measure.

This time it was at last realized what ruin Persian victory would spell for all the independent city-states, and so there was some attempt to secure Greek unity. The Spartans sent 5,000 men under the command of one of their kings; and, if this small force failed to achieve success, at least the heroism with which Leonidas and his men, attacked on both sides, held the Pass of Thermopylæ until they had all been cut down, remains one of the most heroic deeds of military history.

Through the Pass, over the dead bodies of the Spartans, the Persian army now swept towards Athens, whose population was forced to leave the city to its fate and watch from a distance the Acropolis burst into flames.

Yet the final issue of the invasion was to be fought on the sea in the bay of Salamis (480 B.C.), where the Greek allies had managed to collect a fleet of 300 ships from different cities. It was due to the foresight of her statesman, Themistocles, that Athens, since the battle of Marathon, had built a navy; and his was the master-mind in the allied council of war that urged an immediate engagement rather than flight.

General opinion was against him, since the Persian ships at anchor off Phalerum, the former port of Athens, were overwhelmingly superior in numbers. Themistocles, pretending to turn traitor, sent a secret message to Xerxes bidding him attack before his prey escaped. Caught in a trap by the sudden appearance of the enemy's fleet in full battle array, the Greek navy forgot its differences and, under the eyes of Xerxes enthroned on a hill above the bay, gave so good an account of itself that the oncoming Persian ships were thrown into confusion, and the larger number boarded or sunk.

Even before the battle was over Xerxes, losing heart, had fled; and Greece was saved for many centuries from Asiatic dominance.

XI

THE AGE OF PERICLES

THE years immediately after Salamis were spent by the Athenians in rebuilding their city, which lay in heaps of blackened ruins. The mud-brick houses and farmsteads were first restored, but Themistocles, so popular at the time that everyone did whatever he advised, insisted on fortifying the harbour (Piræus) and on the construction of the "Long Walls" round the town.

For some years the Acropolis lay ugly and scarred; and then, as the Athenians recovered from the Persian invasion, an outburst of patriotism showed itself in gratitude to the patron-goddess, Pallas Athena. In her honour they raised that famous temple, the Parthenon. Its architects were Ictinus and Callicrates, and Phidias, the famous sculptor, was one of those who carved its marble frieze representing an Athenian festival. This frieze is now in the British Museum (Elgin Marbles). Phidias also carved a statue of Athena in ivory and gold, forty feet high. It stood in the Parthenon, but has long disappeared. Indeed, since in the seventeenth century of our era the Parthenon

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

was employed as an arsenal by the Turks, it is really surprising that so much still remains undamaged.

Pericles (*c.* 490-429 B.C.).—The statesman chiefly responsible for the building of the Parthenon was not Themistocles, who had fallen from favour (471) and been ostracized, but Pericles, an Athenian aristocrat who was yet a great upholder of public liberty. His home policy was to make the Athenians truly self-governing, and as a means of securing this he suggested the payment of those who served on juries. These juries consisted of some two hundred men chosen from the whole body of free citizens. As well as listening to the evidence they acted as judges, and, after Pericles' measure was passed, would receive a small sum per day for this work.

Another task for the Athenian citizen was to vote in the Assembly, which met ten times a year to discuss and settle most of the important public business; or it might be to serve on the executive council of five hundred, drawn equally from the ten tribes into which the whole free population was divided. He must also be prepared to serve in the army or navy; in fact the policing of the town, which was entrusted to Scythians, was almost the only civic task which might not fall to him by lot. The post of Strategus, or military commander, was elective, and usually given to an Athenian of standing.

Democracy, interpreted so thoroughly, led of course to instability in the conduct of affairs as well as unnecessary delay, but at least it stimulated individual minds and made men feel that each of them had some responsibility for the guidance of their city-state. Athens had its traitors; but most of her sons loved her with whole-hearted—we could almost say whole-timed—devotion, if it had not been that during these years, through their labours in the field, market and workshop, her agriculture, commerce and industry flourished as never before.

Much of the actual manual labour in such trades as carpentry and pottery-making was done by slaves, as well as a share of the drudgery on the farms producing corn, olive oil or vines. Slaves were not ground down and despised like the Spartan helots, nor, except in the case of those working in mines, exploited and driven to death. They were accepted as part of the household to be respected, and a few could even look forward to their freedom and that limited citizenship accorded to the outlander, or foreigner, living in Athens.

If Pericles' home-policy was based on the wish to make democracy intelligent and capable, his foreign policy, at any rate during the earlier part of his career, aimed at her expansion as an imperial power. This had also been the desire of Themistocles, and only a few years after Salamis a foundation had been laid in the Delian League (478 B.C.) which grouped a number of the city-states under Athenian leadership. Its object was to unite in order to oppose any further Persian aggression. The treasury of the League was first of all established at Delos, but later Athens became its guardian, and was accused of applying the funds to the rebuilding of her city rather than for mutual needs. This Pericles felt he had a perfect right to do because he regarded the lesser members of the League as far more the subjects of Athens than her allies.

The Peloponnesian Wars.—The greatest enemy of the Delian League was Sparta, who saw Athenian imperialism as a menace to her own independence. Hostility smouldered between the two states. At last a war* broke out (459-446 B.C.) which weakened both Sparta and Athens without either of them gaining any spectacular advantage, and they agreed to a thirty years' truce. So fierce was their hatred still that each side waited only an occasion to violate it. This came when a quarrel arose between Corinth and the island of Corcyra (Corfu), and both appealed to Athens for judgment. Having given it in favour of Corcyra, Athens sent some ships to preserve the integrity of the island, and Sparta at once took up the cause of Corinth.

This was the beginning of the Peloponnesian Wars (431-404 B.C.), so graphically described by the historian Thucydides. "Never," he says, "were there so many cities captured and depopulated. Never were exile and slaughter more frequent."

After ten years there was a lull, each side agreeing to give back any conquests it had made; but civil war had become a habit and Pericles, who towards the end of his career had acted with cautious statesmanship, was dead. Instead, the most powerful man in Athens was Alcibiades, brilliant in intellect but entirely unprincipled.

To further his own ambitions, Alcibiades persuaded Athens to renew the war, and in 416 set out in command of a fleet against the city of Syracuse, a colony of Corinth. Furious at being recalled almost immediately to answer a charge of impiety, he fled to Sparta, whose help enabled Syracuse to surround and capture the entire Athenian expeditionary force.

Athens never quite recovered from this blow; and, as she weakened, all who had been her enemies leagued against her, while her subject towns rebelled. In 404 Sparta, at the head of the Peloponnesian League, compelled her to surrender, and her "Long Walls" and the fortifications of the Piræus were destroyed.

*Sometimes called the First Peloponnesian War.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

An Age of Learning.—The days of Pericles had been a golden age of art and architecture. It was also a time of great literature. One sign of the high level of general culture was that this literature was not enjoyed merely by a leisured intelligentsia. The whole free populace crowded the open-air theatres to applaud and criticize the plays of the great dramatists, Æschylus, Sophocles and Euripides.

The two former belonged to a generation which had experienced the Persian wars. Æschylus (525-456 B.C.) had been actually called from writing his plays to fight the Persians, and on his tomb were inscribed by his orders the words, "the grove of Marathon can bear witness to his good soldierhood." He was much prouder of this military success than of his literary fame.

Sophocles (495-406) as a boy of sixteen saw the sea-fight of Salamis from a neighbouring island; but the hey-day of his career was spent in a triumphant and prosperous Athens. His *Antigone* is perhaps the most celebrated drama in Greek literature.

Yet a third great dramatist of this age was Euripides (480-406 B.C.), a very different type of character from the genial and easy-mannered Sophocles. He was a farmer's son and lived on the island of Salamis, using for his study a cave which in Roman times became a tourists' peep-show. Lonely by nature, his deep love for Athens developed from the ordinary patriotic pride of a young man into a tortured brooding over the underlying problems of life and death. In his last plays "the joy of battle is mostly gone, the horror of war is left."

Such speculations did not make for personal popularity. Euripides was denounced by orthodox patriots and baited by the comic dramatists of his day, but his attitude to life was really symptomatic of the changing world. No longer, as we have seen in the case of Thales of Miletus, were intelligent men able to accept the legends of the gods of Olympus at their face value. The older dramatists succeeded in idealizing them as great forces of nature working out the inevitable decisions of fate, against which it might be heroic of humanity to struggle but totally vain.

Now, however, about the middle of the fifth century, there arose a class of thinkers, the Sophists, who propounded the question "Why?" to every statement, and proceeded to make mock of the answers they received, treating the world as a kind of comic riddle. They offered to prepare the youth of the day for civic life, that is to show them how to succeed in such practical matters as politics or the law, and their lecture halls were eagerly sought by all the "bright young things" of Athens. The older men and ordinary staid citizens rather naturally disliked them; and it was because Socrates (*c.* 469-399 B.C.) was believed to be a Sophist, undermining civil life, that he was attacked and condemned to die on a charge of impiety.

It was certainly unfortunate that a true product of Sophism, Alcibiades, was one of his pupils. Socrates hated superficial cynicism, and his questioning habit was directed not towards laying the foundation of a smart career, but of teaching what he called "virtue," or "the good life." We can read the impression he made on his day in contemporary writers. Aristophanes (*d.* 385 B.C.) pictures him in *The Clouds* as a tiresome old charlatan; Plato, his disciple, as the greatest of philosophers; and it is interesting to note that the Delphic Oracle proclaimed him "the wisest of living men."

To Plato (428-347 B.C.), philosopher and poet, we owe our chief intimate knowledge of Socrates, and especially of his trial in that famous defence, the *Apologia*. In such works as Plato's Dialogues it is hard to separate the opinions of master and disciple, but when we come to *The Republic* we find Plato himself the first of political theorists to set over against the muddled politics of his own day an ideal government, built, as he conceived it, on practical lines. If they seem to us today largely unpractical, we must remember that the circumstances with which he dealt were utterly remote from any modern political conditions, and also that he was no mere armchair philosopher. He travelled widely, especially in Egypt, and afterwards lectured in Athens, in the grove called the Academy.

There were many travellers in fifth-century Athens, for, like our own, it was an age of insatiable curiosity. Herodotus (*d.* 425 B.C.), probably a friend of Pericles, was the complete tourist, and by his writings about what he saw has earned the nickname "Father of History." Though careful in dealing with his information up to a point, he lacked the detachment and trained deductive methods used by Thucydides (*d.* 399 B.C.) in his history of the Peloponnesian Wars.

Herodotus was a native of Halicarnassus, in Asia Minor, and thus a Persian subject by birth, but his home was for a time at least in Athens, and towards the end of his life in Thurii, the international Greek colony that Pericles tried to set up in southern Italy, but whose prosperity was wrecked by racial quarrels.

Since he was a pupil of Plato, Aristotle the Stagirite (384-322 B.C.) is usually mentioned in connection with his master; but no two philosophers could have approached life from a more different angle. A hard-headed Macedonian, viewing the social and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

political tangles into which Greece had tied herself in his day, Aristotle set up no ideal standards but attempted in his *Politics* and *Ethics* to find a working philosophy of life, and lectured on the same lines to the young men gathered in the Lyceum at Athens.

He has a still better claim to our remembrance now for his love of natural history, and for his insistence on the value of observation as opposed to mere speculation. "This was the first gleam of organized science in the world," it has been said of his researches and the stress he laid not merely on collecting facts but on collating them before drawing deductions.

"Aristotle," writes Professor Cushman, "was the last possible word of Greek philosophy, for he systematized every branch known to the Greeks. He not only evolved a speculative theory of the whole, but he organized the special sciences."*

For some years he was tutor to the young Prince Alexander of Macedon, whose rise to power brings us to a new age not merely in the history of Greece but of the ancient world.

XII

ALEXANDER THE GREAT

WHATEVER the political shortcomings of Athens, she had at least stood for progress, while Sparta, her victorious rival, demanding only a rigid adherence to outworn ideals, lacked the imagination to govern intelligently and so lost her grip on the peninsula.

Athens, dying but defiant, lifted her head to intrigue with Persia and Thebes. In alliance with the latter, a victory was gained over Sparta at Mantinea (362 B.C.) and once more the little world of city-states was thrown into confusion.

This time a settlement was brought about by an outside power, Macedonia, in race and outlook largely Greek, though Demosthenes, the Athenian orator, in his embittered philippics was to denounce the northern king and his court as barbarians beneath civilized contempt.

Philip of Macedon (359-336 B.C.).—Yet Philip of Macedon claimed descent from the Greek hero, Heracles, and, far from despising culture, gathered round him learned men, selecting as tutor for his own heir no less a scholar than Aristotle the Stagirite. A modern writer has described Philip as "probably the best-educated man of his day" and "without doubting, one of the greatest monarchs the world has ever seen."†

He was also a great soldier. Though his early death left to Alexander the task of conquering the world, yet it was the Macedonian phalanx supported by mobile cavalry units, a weapon forged by his experience, that was to break every army opposed to it from the Balkans to India.

Again, it was Philip's idea to weld the Greek states into an alliance by offering to be their hegemon, or federal commander, in a war of revenge against Persia. In this respect, if the League of Corinth that held a peace conference in 338 for the furtherance of panhellenism had been inspired by the philosopher Isocrates, it was also the outcome of the Macedonian king's political ambitions.

Sparta, of course, stood aloof, while Athens was torn in two, the party of narrow patriotism championed by Demosthenes finally gaining the upper hand. A citizen army was put in the field, and at Chæronea (338 B.C.) was completely routed by the Macedonians, the young Alexander being in command of the cavalry.

Alexander the Great (336-323 B.C.).—Two years later Philip was murdered, gossip said at the instigation of his wife, Olympias, who had long been busy sowing dissension between her husband and son. Now at the age of twenty that son became king.

Even more than his father, he was proud of the Hellenic strain in his blood. Ulrich Wilcken, his modern biographer, says, "this deeply rooted and vivid conception of his personal affinity with these heroes (i.e. Heracles and Achilles) is one of the non-rational and instinctive motives without which we cannot understand him at all." The *Iliad* was his bible, ever carried on his travels, as well as the writings of the great Greek tragedians.

Love of Grecian culture made Alexander forgive Athens for her defiance: but when Thebes in her turn presumed to hinder his settlement, the young king ordered her buildings, save the temples and house of Pindar, the poet, to be razed and her 30,000 inhabitants sold into slavery.

Henceforward the once free city-states, if they did not love their Macedonian overlord sufficiently to supply him with ships and levies, remained quiescent through fear, and Alexander was able to begin his invasion of Persia. He crossed the Hellespont, for without a fleet he was in danger of being cut off from his base by the Phœnicians, operating as vassals of the Persians from their cities of Tyre and Sidon.

The desire to capture these cities dictated his march due southwards, which, after two overwhelming victories on the rivers Granicus (334 B.C.) and Issus (333 B.C.), left him in control of Asia Minor and Syria.

* *A Beginner's History of Philosophy* by Herbert E. Cushman, M.A., Ph.D.

† H. G. Wells, *The Outline of History*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Darius III of Persia, who at the Issus had himself fled before the Macedonian cavalry charge, sent ambassadors to suggest the Euphrates as the future boundary between Greece and the Orient. At the council of war that considered these terms the veteran soldier Parmenio declared they were more than Greece could have hoped.

"Were I Alexander," he said, "I would accept them."

"And I," answered the young king, "were I Parmenio!"

He was not Parmenio, and his curt refusal marked a further stage in the prosecution of his ambitions.

To his own military genius was due the successful storming of the almost impregnable island fortress of Tyre (332 B.C.), which after a seven months' siege, suffered destruction for its refusal to surrender. The way now lay open to Egypt which, disliking Persian rule, was quite prepared to accept a fresh conqueror philosophically. Indeed, as the weeks of his visit passed there was even enthusiasm, for Alexander, impressed by the age and dignity of the land of the Pharaohs, treated its religious prejudices with respect, making a pilgrimage to the sacred oasis of Ammon in the desert, whose oracles hailed him obsequiously as the son of their god.

This roused the rugged Macedonians' sense of humour; but Alexander, impressionable and superstitious, was not so sure. Was he not the son of Heracles, a hero? And at least he had no doubt the gods were fighting on his behalf.

Leaving Egypt he rode back up the Maritime Plain, and by the Arbela, near Nineveh, met a new Persian army under Darius III (331 B.C.). With certainty of victory on one side, fear on the other, the issue was not long in doubt. Again Darius turned his chariot and fled, to be deposed and murdered shortly afterwards by his own subjects.

Alexander was now "lord of the Ancient East," his headquarters the former capital of Hammurabi and Nebuchadnezzar. It was a turning point in his career; and later history has disputed whether it was mere youthful lust of adventure or the fulfilment of a settled scheme of world conquest that drove him from Babylon to Susa and Persepolis, from Persia to the old Median capital of Ecbatana, thence almost to the Caspian, southwards through modern Turkestan, northwards again to Samarkand, where finally the call of India drew him down through the passes of the Hindu-Kush to the valley of the Indus.

In judging this amazing campaign it is necessary to remember contemporary geography as Alexander had been taught it by Aristotle. This said that India was on the edge of the world and that the Indus flowed into the ocean-stream surrounding it. Great was the king's surprise, and perhaps disappointment, to learn of other kingdoms and a river, the Ganges, many hundreds of miles distant still towards the East.

In his eagerness to stretch his empire to the farthest limits of the solid earth, he would have pushed on across the central plains; but here his army threatened rebellion, sighing to be back once more in lands and towns it knew.

Even an Alexander, son of Heracles, must yield on occasion to public opinion, and so, travelling part of the way by ship down the Indus and then striking across the desert, he arrived at last once more in Babylon after seven years spent in the heart of Asia.

It had been a magnificent achievement, and not merely as a test of military strength or courage and endurance. If worth nothing else, it added immensely to knowledge, for Alexander, keenly interested in natural history, ordered experts and specialists to investigate the countries he traversed, and sent the fleet that had carried him down the Indus to explore the stretch of country to the Persian Gulf, hitherto known only to Scylax* amongst the Greeks.

In Babylon he was already planning an invasion of Arabia as a prelude to the conquest of the western Mediterranean, when malarial fever attacked him after a drinking bout, and in June, 323 B.C., at the age of thirty-three, he died.

Verdicts on Alexander's work will always differ. Some hold he sacrificed the lasting good of Greece and Macedonia to the will-o'-the-wisp of military glory, that he made no roads as good as those of the Persian empire, that he originated no form of government higher than that prevailing in the Orient, that he did nothing to preserve his conquests for his successors. When admirers of Alexander point to the marriages he and ninety of his generals contracted with Persian wives as a considered step towards race-fusion in the Hellenic empire, it is answered that he was actuated merely by love of Oriental luxury, and that his aping of Persian customs and ready acceptance of divine homage went far to alienate his Macedonian subjects.

There is little doubt that continuous success turned Alexander's head, as well it might; yet against what he failed to achieve must be reckoned the towns he caused to be built as outposts of Hellenic civilization along his lines of march, and the extent to which the culture he worshipped permeated both Egypt and the East. He found himself king of a Greece rebellious and distracted:

* See Chapter VII

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

he left an empire so hellenized that two generations later learned Babylonians and Egyptians were contributing to literature books written in the Greek tongue.

One great moral example he left to future empire-builders, namely a policy of sympathetic conciliation towards the conquered in the place of the terrorism with which former victors had been wont to impress their triumphs.

"Alexander was the inaugurator of that comprehensive cosmopolitanism which reached its apogee in the Roman Empire," says a modern writer, or, as a Greek shortly after his own day expressed it simply, "He made of one every race of men."

XIII

HELLENIC CIVILIZATION

The Hellenic Empire.—The heirs to Alexander's dominions were a weak-minded half-brother and a son born of his first wife Roxana after his death. Both failed to survive the ensuing conflict of greed and ambition that finally divided the empire amongst the "Diadochoi" (successors).

These successors of Alexander were three of his generals: Antigonus, who received Greece; Seleucus, the Asiatic possessions; and Ptolemy, Egypt.

All were able, but there was no doubt Seleucus had the hardest task in attempting to hold together the conglomeration of races that made up a vastly expanded Persian empire. India was soon lost to a native king,* and indeed, before long, the Seleucids were confining their attention mainly to Syria, where they founded a capital at Antioch, on the lower Orontes.

The rest of the kingdom and the neighbouring provinces they planted with colonies of Greeks brought from the mainland; each a self-governing community in control of local affairs but paying taxes for the upkeep of the central government.

One of the most famous of the Alexandrian towns in Asia Minor was Pergamum, with its Grecian temples and colonnades. For a time it achieved complete independence, and was sufficiently powerful to hold at bay hosts of invading Gauls, who have left their name in their final place of settlement, Galatia. The impression the strength and valour of these barbarians made on the cultured Greeks can be seen in famous statues of the day, such as "The Dying Gaul," and the Pergamese altar-sculptures dedicated to Zeus.

Antigonus, who had achieved the European possessions in the general scramble for spoils, lost his life in an attempt to secure the whole empire, and his grandson of the same name, Antigonus II, was content to be merely king of Macedonia, though even this patrimony he did not enjoy undisturbed. His chief enemy was Pyrrhus, king of Epirus on the Albanian coast, with whose military ambitions in another field we shall deal later.*

It was not in Europe or Asia that the Hellenic Empire attained its zenith after its founder's death, but in Egypt under the Ptolemies (323-30 B.C.). Here the Greeks had possessed for some time an important commercial settlement, Naucratis, but this was to fade into insignificance before Alexandria, the seaport founded in his lifetime by the young conqueror to replace the Tyre that he had laid in ashes.

Alexandria.—Alexandria takes rank with Athens and Rome amongst the cities of ancient days. Its Pharos, or lighthouse, that became a model for both Christian spire and Mohammedan minaret, stood in colossal grandeur, gazing over the harbour, for some 1,600 years. This harbour was, in the early days of the Ptolemies, the central market of the Hellenic world, protected by their fleet which dominated the western Mediterranean. Here could be found the spices, precious stones and perfumes of the Orient; the ivory, ebony and gold of the hinterland of Africa; Cornish tin and Baltic amber.

The town had its prosperous foreign quarters, Jewish, Persian and Syrian. The Alexandrian Jews of the "Diaspora" (dispersion) were said to outnumber those of their race in Jerusalem itself. So much, too, had they taken colour from their surroundings that it was found necessary to translate their scriptures into Greek (the Septuagint).

The Alexandrian Museum has been called "the first university in the world." Endowed by the Ptolemies largely to promote research in science and other branches of learning, it had also its lecture halls, where Euclid presented his problems to students in much their present form.

Other noted men of learning in Alexandria were Aristarchus, the astronomer, who more than 1,200 years before Copernicus discovered that our world and other planets must revolve round the sun; Eratosthenes, the geographer, who by mathematics arrived within fifty miles of the true diameter of the earth; Herophilus and other doctors who (though not, it is said, without the vivisection of criminals) deduced the brain to be the centre of the nervous system.

Even more famous than the scientists actually living in Alexandria at this time was Archimedes the Syracusan (*d.* 212 B.C.), who corresponded with those engaged in

* Chandragupta. See Chapter VI.

* See Chapter XIV.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

research at the Museum on his discoveries, including specific gravity and his inventions for moving heavy objects by systems of cranks and levers.

One thing besides her Museum that drew men of learning to Alexandria, was her libraries, also under royal patronage. Their shelves were piled with thousands of rolls of papyrus books, and an army of copyists was kept perpetually employed in restoring the pages injured by constant thumbing, and in making fresh copies of manuscripts that had been lent, or taken from their owners forcibly by the king's orders. The most famous librarian of Alexandria was Callimachus, who not only catalogued the collection but hit on the plan of dividing up books into a number of small rolls for easier handling.

Fire and pillage finally scattered this unique collection, though how far it was the result of the Arab destruction of the city in A.D. 642 is uncertain.

Hellenism.—Hellenism is a word coined to "describe particularly the latter phases of Greek culture, from the conquests of Alexander to the end of the ancient world, when those over whom this culture extended were largely not of Greek blood."

This mental ascendancy of Greece can be traced back to the famous days of Athens, when Ictinus and Phidias in the world of art, and the great philosophers, more especially Socrates and Plato, cast their spell over human imagination. Athens might decline from the naval supremacy bestowed upon her by her victories over Persia, but Phidias had his successor in Praxiteles (364 B.C.) and the early philosophers in Zeno, an Oriental Semite, founder of Stoicism,* who preached the way of duty and self-control, and in Epicurus (*d.* 270 B.C.), of Athenian descent, who, if he counselled the pursuit of pleasure, yet added for men's guidance, "we cannot live pleasantly without living wisely, nobly and righteously."

The influence of such doctrines spread through the whole of the civilized world, and students from every quarter flocked to Athens to learn of the masters.

In 401 B.C. Xenophon, the historian, pupil of Socrates, had made his famous "up-country march" (anabasis) through Persian Asia Minor at the head of his small band of Greek mercenaries. This expedition, heroic though it was, seemed as nothing before the triumphal progress of the young Macedonian king, whose life work was not, in its real essence, the building up of a material empire, but the stamping of civilization with an Hellenic impress which it still bears in part today.

It was in the realm of religion that the impress made its deepest mark. In Alexandria, against the tolerant background of Greek philosophy, all religions were weighed and discussed: the oracular pronouncements of Delphi, monotheistic Judaism, Egyptian worship of Osiris, Isis and Horus, mystery cults of the Orient.

Under the pressure of argument and oratory even the most fanatical barriers showed cracks, and faiths absorbed something of each other's essence. One outcome was the tendency to deify rulers after the Egyptian fashion; but, save as the hall-mark of political patriotism in later Roman times, this payment of divine honours to living men lacked any depth of conviction.

What humanity sought was something mystic, at the same time less hard and less nebulous than Greek philosophy: such a faith as would, if possible, bring the purity and majesty of the Jews' invisible Jehovah into a closer relationship with weak and suffering humanity. Thus the ground was prepared for belief in a "God made Man"; and, as pioneer of Hellenic civilization, Alexander has been claimed as "in the end pioneer of Christianity itself."*

XIV

THE EARLY YEARS OF ROME

From very early in the dawn of history nomadic waves of population had surged into the Italian peninsula from the north, some using the western coast-track, some the "amber road" through the Brenner Pass, by which that coveted article of merchandise had long been brought from the Baltic for export on the Mediterranean seaboard.

By about 1000 B.C. "Italic" tribes of Indo-European stock had driven the native Iberians southwards before them and established small agricultural communities, for whose continued existence they were soon forced to fight against hordes of Semitic invaders landing on the Tuscan shores.

These Etruscans are one of the mystery peoples of the ancient world, for we cannot read the inscriptions on their monuments; but what is left of their civilization shows that it had reached a high level in both building and metalwork, and that it probably had close commercial relations with the Orient.

It was indeed many stages in advance of the simple existence of the Italian peasant-folk, so that when Rome began to rise on her seven hills, close to a convenient ford across the Tiber, it was the Etruscans who ruled there as kings over the inhabitants of

* *Stoa*, a Greek porch, i.e. the Painted Lecture-hall of Athens.

* See Angus: *Mystery Religions and Christianity.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

"Latium." Legend has given the date 750 B.C. as that of the founding of Rome, but without any more historical justification than the tale of its original building by Romulus and Remus.

At length the Latins, or Romans as they came to be called later, rose in rebellion and drove out their tyrannous kings. This remarkable success had been favoured by outward circumstances. The smiling land of Italy had in the course of time invited other invaders to settle there besides the Etruscans. One body of settlers were colonists from Corinth and similar Ægean city-states, who established "Great Greece"* on the southern coasts and disputed Sicily with Carthaginians from North Africa. In the north there were Gallic tribes who settled in large numbers between the Alps and the River Po.

The Roman Republic.—Somewhere about 500 B.C. the Roman King (Tarquinius Superbus, according to legend), at war with his neighbours and exhausted by the struggle, failed to withstand the disaffection within his own state. His subjects drove him out, became masters of the city, and set up a Roman republic, placing the chief power in the hands of two Consuls, who were to be elected yearly from amongst the principal landowners, or patricians. Since this arrangement left the poorer population, or plebeians, entirely at the mercy of the better off, the former presently secured officials of their own—the tribunes—to whom complaints of any kind could be made.

The internal history of the Roman Republic for some two centuries after its establishment is that of a perpetual struggle between patricians and plebeians. On the whole, since the Latin character was naturally conservative, the patricians won, and the Senate (originally the council of "old men"), who came in time to conduct all the important business of state, was chosen from this class alone.

On the other hand, the plebeians succeeded after an embittered struggle in obtaining the codification of the laws of the republic in the Twelve Tables (451 B.C.), and permission to appeal to the General Assembly by the Lex Valeria (509 B.C.) when lives and rights of citizens were at stake.

It was unfortunate that as Rome grew the meetings of this Assembly were doomed to become a farce. In the small city-state of Athens, such a body could take a genuine share in civic life; but in a republic rapidly spreading over the countryside it was obviously quite impossible for all to attend or even hear the Herald's proclamation of its opening. Thus it tended to develop more and more into what Mr. H. G. Wells has described as "a gathering of political hacks and the city riff-raff."

It is interesting to compare the political situation in Greece and Italy in early times. The Greeks were as contemptuous of "outlanders" as the Chinese were of "foreign devils"; and city-states of the Ægean shrank as a rule from widening their franchise; and until the time of Alexander rulers treated subject races with a distant patronage that chilled loyalty and prevented fellowship.

The Romans in their early days of expansion were far less exclusive, granting citizenship to the peoples they absorbed, and ensuring a strong nucleus of loyalty in each district by planting it with a colony of their own surplus citizens, to whom were given individual grants of land and the protection of the home government.

Through such practical foresight, Rome, when she went to war with Carthage in later centuries, was able to put in the field armies made up of sturdy peasant-farmers, and the ideals of the republic were respected even when her actual government proved too often corrupt and selfish.

The Conquest of Italy.—After the establishment of the republic Rome found herself, as chief city of a league of Latin states, involved in a series of wars within the peninsula. First of all there were the Etruscan strongholds to be subdued, such as Veii (captured 396 B.C.), but this laid a way open to the Gallic tribes who for a while gained the upper hand and even sacked the town of Rome itself (382 B.C.). Those in the citadel, aroused by its cackling geese, we are told, withstood all attacks; and when the Gauls, accepting a ransom, withdrew once more, the garrison emerged and the population began to rebuild their town.

Within a generation, Rome was engaged in a life and death struggle with another "Italic" race, the Samnites, who had made their homes along the Apennines and were now trying to absorb the western plain, the Campania.

At Sentinum (295 B.C.), the Romans finally crushed the Samnite levies and so decided the future of Italy for over two thousand years.

The next contest was to be with Great Greece; and here, had the wealthy colonies shown any more ability to act in union than the city-states of their home mainland, it might have gone hard with the far less civilized Romans. Perpetual internecine warfare in the past, however, prevented any chance of unity; and when Roman expansion began to threaten Greek independence, it was to Pyrrhus, King of Epirus (modern Albania), across the seas, that

* See Chapter X.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Tarentum, the wealthiest state in southern Italy, appealed for help.

An adventurer born, Pyrrhus was soon on the scene with his chariots and his elephants, routing the Romans at Heraclea (280 B.C.) and then pushing on triumphantly to secure the greater part of Sicily; but this was to bring a new enemy into the field. The western part of the island was held by the Carthaginians, who, lacking prophetic vision, feared the Romans less than they did Pyrrhus. It was largely the appearance of their fleet as an ally that caused the Romans to reject the terms offered them by Pyrrhus after his victories, and which sent that royal adventurer swiftly back to Epirus before his line of communication was cut.

The Greek cities, now deserted by their protector and, as usual, torn by internal feuds, allowed themselves to be conquered piecemeal by the Roman armies. By 275 B.C. the little republic of the Tiber banks had become ruler of all Italy south of the Po.

XV

THE PUNIC WARS

The Influence of Greece on Rome. — Rome had conquered Great Greece. Just that ability to unite and pursue some practical ambition with bulldog tenacity which the average Hellene lacked, the Latin possessed to a fuller extent than any other race of ancient times. Thus, in the struggle for world domination, the Latin was to gain a spectacular victory; but there are two sorts of conquests, and in the kingdom of the mind and spirit it was the Greek who triumphed, and whose culture was to permeate and transform the minds of those to whom he lived in political subjection.

"The strength of the antique Roman character lay in its narrowness, its Calvinistic sense of sin, its austere conceptions of personal duties, its hardy ascetism, its rigid family ties."* This being so, in the early days of the republic art and literature meant little; religion, animistic and formal, depended mainly on exactness of ritual; and the state's public worship of Jupiter, Mars, Ceres and other deities was merely a development of the household reverence for its "Lares et Penates."

Then came the conquest of southern Italy, so largely Hellenic, opening the door to a new world. In Greek philosophy the Latin student found a key to secret chambers of the mind of whose very existence he had hitherto scarcely been aware. The natural lover of beauty and luxury revelled in the sudden realization of what art could add to mere existence. Thus Rome began to demand a wider life, softened by the culture and material comforts which city-states such as Syracuse, Neapolis and Tarentum had long regarded as necessities.

The way to such a goal lay obviously through the development of trade relations with the Orient, but to free the seas for such commerce the republic on the Tiber must break the monopoly of Carthage, her ally in the late war against King Pyrrhus, whose fleet now reigned supreme in Mediterranean waters.

Carthage. — Carthage, on the North African coast, was the last of the great Semitic empires of the Ancient World. A Phœnician colony in origin, dominated for a while by Libyan tribes from the hinterland, it was at this time an independent state nominally ruled by two elected Judges, but really by an oligarchy of merchant princes. In regard to a prolonged struggle with Rome it had the advantage of naval experience—we have already drawn attention to the adventurous spirit of Phœnician seamen—as well as a treasury heaped with the profits of world-wide commerce, but while the Latin republic could draw on a loyal citizen army of peasant proprietors, the Carthaginians had only foreign mercenaries, since the estates of their landed class were worked by slave labour.

The First Punic War (264-241 B.C.).— The struggle between Rome and Carthage has been called "the most wasteful and disastrous series of wars that ever darkened the history of mankind."

The first of this series was concerned with the disputed ownership of the island of Sicily, Carthage having sent aid to the Greek tyrant Hiero of Syracuse, who was struggling to preserve his patrimony from a band of Italian adventurers, the Mamertini, supported by Rome.

On land the Romans occupied Messina, and won over Hiero as their ally, driving the Carthaginians into the western coast towns, but in order to do more than this it was necessary for them first of all to build a fleet of quinqueremes (galleys with five banks of oars) and then to find the navigators and oarsmen who could direct and work them. Now the Roman's practical mind realized that seacraft was a skilled trade which he could not hope to learn all in a day. His genius was military rather than naval, and so instead of studying how to ram the enemy's vessels and break their oars in the orthodox sea-dog fashion, he invented a bridge with grappling hooks at the ends, which once he had manœuvred his ship alongside another, would hold the two fast. By means of this bridge soldiers could

* See *Julius Cæsar*, by John Buchan.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

board the enemy vessels in large numbers and so turn a sea-fight into the sort of hand-to-hand engagement at which the Romans fancied themselves on dry land.

To the surprise of the Carthaginians their enemies, following this method, proceeded to win several victories at sea, but still the tide of war did not always run in the same direction, since the North African city had found a great general in Hamilcar Barca, and his stubborn resistance in Sicily began to exhaust Roman resources. It needed the building of a new Roman fleet of two hundred ships to reduce the last Carthaginian stronghold, and then with the complete surrender of the island the first Punic War came to an end.

The Second Punic War (218-201 B.C.).—This is sometimes called the Hannibalic War after the Carthaginian general, Hannibal, son of Hamilcar Barca, whose military genius dominated its course. We are told that the father had made his eleven-year-old son take an oath of undying hatred to Rome. By the time he was twenty-four Hannibal was prepared to put this oath to its test, in spite of the opposition of a peace party in his own country.

His military experience had been gained in Spain, that Carthaginian outpost of the west, under his brother-in-law Hasdrubal. While Rome's attentions had been distracted by Gallic invasions in North Italy, Hasdrubal had been opening up the Spanish Mediterranean coastline as far as the Ebro, founding New Carthage (Carthagena) close to some silver mines, and raising an army which he trained in wars against native Iberians and Celts.

It was easy enough to pick a quarrel. Only a few years after peace had been made the Latin republic had seized the Carthaginians' towns along the coast of Sardinia and Corsica, and now on the far side of the Ebro she was stealthily taking certain Greek colonies under her protection and forbidding her rivals to cross the river. In 221 B.C. Hasdrubal was assassinated. Two years later, without sanction from Carthage, his young brother-in-law, at the head of 40,000 men, was on the march across Southern Gaul.

The ensuing war has been described as "a colossal contest between the nation, Rome, and the man, Hannibal." Evading a Roman army near the Rhône, Hannibal crossed the Alps in 218 B.C., but it was already autumn, and his cavalry and elephants, accustomed to the climate of Spain, suffered terribly from cold and insecure foothold in the mountain passes. He had hoped to raise the Gallic tribes north of the Po in his favour, but those who joined him proved raw recruits, and his own seasoned veterans were woefully few compared to the enemy. Nor, since the Roman fleet now held the seas, could he expect reinforcements from Carthage.

It was a mad adventure; but Hannibal, who had heard of Alexander the Great's conquests from his youth up, advanced confidently on the road south, ambushing and cutting to pieces the legions of an unwary Consul on the shores of Lake Trasimene. Rome herself, it seemed, lay ready for him to sack and pillage; but Hannibal had no siege machines and turned away towards the Adriatic. One more big battle and he felt sure he could compel her to submit.

A certain Roman general, Fabius (from whose name we derive "Fabian tactics"), fearing this might prove only too true, was careful not to give him the chance, but pursued a policy of perpetually harassing his army and trying to break its morale. Unfortunately Rome misunderstood this caution and appointed new Consuls instead of the man they derisively called "the Delayer" (Cunctator), with orders to give Hannibal instant battle. The two armies met at Cannæ (216 B.C.), where the Carthaginian, with a larger number of cavalry but much fewer heavy armed infantry than his opponents, utterly annihilated them.

This campaign of Hannibal, which lasted fifteen years from his crossing of the Alps, has been aptly termed "the most brilliant and futile raid in history." Yet had outside forces, Philip V of Macedon (with whom he formed an alliance), the subject Greek cities of Italy, and his own home government, really combined to give him adequate support, he must surely have crushed the enemy he had so steadfastly hated.

As it was, Rome, drawing stubbornly on her resources of citizen levies, was able to create new armies. Syracuse,* Tarentum and Capua were reduced, and an army under Publius Cornelius Scipio (later called Africanus) drove the Carthaginians out of Spain. Scipio now demanded to be sent to North Africa, and the Carthaginian government was compelled to recall Hannibal from Italy to deal with him. He obeyed the summons, and at Zama (202 B.C.) a decisive battle was fought that crushed the power of Carthage and left Rome mistress of the western Mediterranean. Peace was made on humiliating terms for the conquered, and Hannibal fled to the East where, hunted from court to court, he at last poisoned himself.

The Third Punic War (149-146 B.C.).—During Hannibal's prolonged Italian campaign the hatred to which as a boy he had vowed his life had sowed its dragon's teeth amongst his enemies. Carthage, once peace was made, contrived not only to pay her

*Archimedes, the scientist, was killed during the Roman siege. See Chapter XIII

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

heavy war indemnity but even to recover some of her commercial prosperity; and this caused dismay and fury amongst Italians whose dead had strewn the field of Cannæ and who had trembled lest Rome herself be sacked. Loudly they shouted their agreement when in the Senate the old diehard Cato mouthed his perpetual hymn of hate, "Carthage must be destroyed."

Fifty years passed and a new generation imbibed the frantic jealousy of the elder. Seizing an occasion of Carthage having dared to resist the continuous aggression of her neighbour Masinissa, King of Numidia, without leave from the Senate, thus violating one of the original peace terms, Rome declared war. In the course of a three years' campaign her armies at last stormed and sacked Carthage, thus blotting out for ever the old Phœnician empire.

Through her Punic Wars, Rome had not only gained control of the Western Mediterranean but emerged as an imperial power. It remained for her citizens to pay the price of such overwhelming success.

XVI

REPUBLICAN ROME

Republican Wars in the East.—Immediately after the second Punic War, those who were demanding that not one stone of Carthage be left upon another sought also revenge against her allies. The special object of Roman fear was Philip V of Macedon, and it was pointed out that if an attack were made upon this ambitious successor of the great Philip, it would be warmly welcomed by Athens and Sparta who, since Alexander's death, had contrived to regain a shadowy independence.

The other city-states of Greece were divided by the Gulf of Corinth into the Achæan League to the south, the Ætolian to the north; the former in vassalage to Philip, and the latter in consequence antagonistic. At Cynoscephalæ (197 B.C.), near a ridge of hills called "Dogs' Heads," the King of Macedon and his Achæans met the Roman legions supported by Ætolian cavalry, and were cut to pieces, Philip himself escaping but leaving 8,000 dead on the field.

This was the end of Greece as a political force in the Ancient World. Macedonia dwindled from a kingdom into a Roman province, and when the Achæan League ventured later to oppose the Republic a thousand of her young nobles were carried away as hostages and Corinth was burnt to the ground. Amongst these hostages was Polybius (*d.* 120 B.C.), who afterwards wrote a history of the Rome he had learned to admire.

In the Orient, Antiochus of Syria, attempting to absorb into his Seleucid Empire some of the possessions of the fallen Philip, was the next opponent of the Roman armies. At Magnesia (190 B.C.) the legions routed his undisciplined Orientals and a peace was made that brought the coasts of Asia Minor and Syria within the Roman dominions. When in 168 B.C. Egypt offered herself as a subject state the Mediterranean had become a Latin lake.

The Republican Government. — The government of the Roman republic was professedly based, we have seen, on the will of an assembly of its free citizens; but long before her empire was achieved the association of her name with political principles of liberty and justice was scarcely more than a fiction.

The Italian allies of the city of Rome ("Italici") had fought in her armies in the Punic Wars but were still denied rights of citizenship, since the early policy of following each absorption of territory by wise grants of rights had been long discontinued. Thus discontent was seething, caused as much by resentment as by the terrible economic conditions resulting from Hannibal's devastations and protracted foreign wars.

Properly administered, the vast accumulation of indemnities and spoils that made direct taxation unnecessary should have more than paid for sound schemes of reconstruction; but unfortunately "in no department was the failure of republican government . . . more conspicuous than in the field of finance."*

Loot and the chances of personal advancement offered by official posts at home and in the government of the provinces went to enrich a new moneyed class, as alien from the old patrician of high principles and simple life as from the sturdy peasant farmer. Since land represented social position, the war profiteer used his sudden wealth to add farm to farm, building up huge estates (latifundia) worked by the cheap slave labour that the perpetual wars of conquest threw on the market. No patrician landlord of modest means or peasant-farmer could hope to compete either with those who farmed on such methods, or with the importers of corn from Sicily sold at a cheap rate by the government to satisfy the dangerous proletarian element growing up in the towns.

Roman Slavery.—Slave labour was indeed the canker secretly corrupting the republic, as it was later to eat the heart out of the empire. The household slave was often a pampered retainer, and freedmen of this type were known to sit in the Senate

* See Greece of Rome, edited by Bailey.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

itself and hold high office. The cultured Greek, especially if he came from Athens, might patronize his less educated master, and bring up his sons. There was, however, an altogether different kind of slavery which, employing plantation methods of whip and chain, brutalized both employer and employed, dragging human labour into degradation.

The desperate obstinacy of the prolonged "Slave War" in Sicily (140-132 B.C.) and of the revolt of Spartacus and his fellow gladiators in southern Italy (73-71 B.C.) were witness to a misery that preferred to face death by crucifixion rather than continue existence under conditions allowed by Roman law.

Political Revolt in Italy.—The political situation during the third and second centuries before Christ has been summed up in the phrase, "the Senate governed but did not reign, while the people reigned but did not govern."

As social conditions grew worse during and after the Punic Wars, various efforts were made by popular leaders to improve them, though not to amend the *comitia publica* from any more workable angle.

"The first systematic attack upon the senatorial government is connected with the names of Tiberius and Gaius Gracchus." Their appeal was to the old Licinian Law (367 B.C.), limiting the amount of land that any one person could buy. This had been allowed to become a dead letter. Tiberius Gracchus (Tribune, 133 B.C.) suggested that the surplus of the legal amount should be redistributed amongst the poor. "You are called masters of the world," he said, addressing those who had elected him, "yet the beasts which roam over Italy have each their den . . . and they who have fought for Italy have only light and air in it."

This was too dangerously near the truth for rulers of Rome to listen to unmoved. At the end of his year of office Tiberius Gracchus was set on by a mob of senators and murdered. In 121 B.C. his brother Gaius met the same fate.

After his murder, the popular cause languished until it found an eloquent spokesman in a Roman noble, Marcus Livius Drusus (elected Tribune 91 B.C.). By this time the hostility between Romans and Allies (Italici) had become so intense that when Drusus declared himself in favour of the complete enfranchisement of all Italians the senators were able to stir up the mob in Rome itself against him, and like the Gracchi brothers he was assassinated.

This was a blind act of folly, for the Allies blazed into rebellion in the "Social War" (91-88 B.C.), a struggle carried on with such passionate intensity that Rome, even when her generals gained the upper hand, was forced to yield to the rebels' demands, lest they should carry out their threat of forming an independent state. Thus the Italici south of the Po were duly enfranchised, though since they must still go to Rome to vote in the "comitia" this privilege was at the time rather a sop to their pride than a political safeguard.

Marius. — If at home the Senate was forced to act against its will by the Social War, overseas in North Africa its prestige had received a severe wound some years before. The trouble had originated with an African prince, Jugurtha, who, defying senatorial decrees, had made himself the independent ruler of Numidia.

In earlier years he had served in the Roman army in Spain and had also been in Rome itself, which he aptly described as "a city for sale." He proceeded to buy the Roman generals sent against him instead of fighting them, defying the republic until intense popular indignation led to the appointment of a certain Marius as Consul (107 B.C.).

Marius was of peasant birth but loyal, hard-headed and practical. Without more ado he enrolled regiments from the workless poor, drilled and paid them, and then, when he had brought his army to a high state of efficiency, led it against Jugurtha. The desultory seven years' war came to a prompt close and Jugurtha, loaded with chains, was brought back in triumph to Rome.

Marius also defeated the Cimbrians and Teutons, who were causing trouble in the north of Italy, and thus became the hero of the Roman populace. His rise to power opens up a last chapter in the history of the republic that has been called the stage of "one-man rule"; but before we enter on this we must deal with the changing social conditions that made it possible.

The Roman Army.—Numbers of free peasants, we are told, helped the slaves set fire to their masters' villas at the time of the Sicilian rising. Landless themselves, through the creation of the slave-run "latifundia," there was no opening for them or their sons save in the army, where luck or courage during a foreign campaign might raise them to the moneyed class.

In all the history of republican Rome there is no more important change than this transformation of the national citizen levies, returning to harvest their fields when their campaigns were over, into the professional legions who made "war the national industry of the Roman republic."

This change originated first through the impossibility of holding down distant provinces such as Spain with a home militia. Men had to be enrolled for longer

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

terms of foreign service. For this they received pay and booty, and also became disciplined and highly trained. In time they acquired *esprit de corps* and became devoted subjects, not so much of Rome as of the army, and later of their special legions.

As we have seen, the man who was more responsible than anyone else for creating the military professional was Marius, who proved himself a great organizer. It was he who improved the legions, increasing their number to 6,000, and dividing each into cohorts of 600, to whose mobility much of the Roman success on the battlefield was due. Its secret was discipline, and this discipline, interpreted as the loyalty of legions to their generals, was to become a deciding factor in Roman history.

XVII

JULIUS CÆSAR

Marius and Sulla.—After his defeat of Jugurtha, Marius was exceedingly popular in Rome. When therefore Mithridates, King of Pontus, began to give trouble in the East, he expected to be sent against him as commander-in-chief. Instead the Senate selected a younger general, Sulla, at that time in the north of Italy.

The Roman people, enraged at this choice, vociferously demanded their old favourite, whereupon Sulla at the head of his legions marched south and insisted on his own nomination. For the first time a Roman Consul took possession of the city by force.

It is true that directly he set out for the East the Romans elected his rival Consul in his place; but Marius soon died (86 B.C.) and, having made a triumphant peace with Mithridates, Sulla on his return easily defeated the citizen armies sent against him. In 82 B.C. he entered Rome as dictator, proscribed his chief enemies and secured the passage of laws reducing the Tribunes and Popular Assembly to impotency. The Senate remained supreme, but it was merely a mask concealing the features of his "one-man rule."

Pompey "the Fortunate" (*d.* 48 B.C.).—War with Mithridates soon broke out once more; and this time a young commander, Gnæus Pompeius, was sent against him. An able soldier, he was often called "the Fortunate" because of his ability in reaping the credit of others' victories as well as of his own. Having cleared the Mediterranean of pirates who had infested the harbours and even held up to ransom Roman citizens whom they captured on the Appian Way, he became the darling of the populace, and on his return from the East was accorded a triumph.

This aroused the secret alarm and jealousy of the Senate, and Pompey, no politician himself, looked round for help against their machinations. He found it in Crassus, a wealthy noble with ambitions but no real gift for leadership, and another budding statesman, Julius Cæsar. These two agreed to stand as Consuls and carry through the great soldier's measures. Thus the First Triumvirate was formed, cemented by Pompey's marriage to Cæsar's daughter Julia.

Julius Cæsar (*d.* 44 B.C.).—Julius Cæsar is probably the most famous name in Roman history. His title as a supreme military genius is scarcely in dispute. Republican Rome, mistress of the civilized world from Spain to the Euphrates, was before his day perpetually at the mercy of the warring tribes along her northern frontier. While she was yet a small city-state the Gauls had penetrated to her Forum. As late as the days of Marius there was still the danger they might do the same.

By his conquest of the Gauls, Cæsar freed Rome from this fear; nay more, it has been said that through the pacification with which he followed up victory in the field, this land beyond the Alps, which was once the seat of barbarism, "was destined to remain the last repository of the Roman tradition."

"Julius Cæsar gave civilization a life of five further centuries before the dark curtain descended."* It is a big claim not to be denied by those who would paint the Gallic people as quiet inoffensive tribes "butchered to make a Roman holiday" for an ambitious politician. Cæsarian politics played their part, no doubt, in fomenting war; but so did the Gauls themselves, chafing restlessly beyond the Roman outposts in the dawn of that big movement, "the Wandering of the Peoples" from the Atlantic to the Chinese Wall.

The Gallic Wars.—It is impossible even to outline here campaigns that can be best read in detail in that contemporary political pamphlet the "Commentaries" (De Bello Gallico) of Cæsar himself. Suffice it to say that in the years 58-51 B.C. the new Governor of Gaul subdued what we now call France and Belgium from the Atlantic to the Rhine, making the name of Rome feared even in the distant island of Britain, visited by Cæsar himself in 54 B.C. That this was not the mere military walk-over of disciplined legions pitted against a rabble, we find in the heroic struggle of the Arvernian Chief, Vercingetorix.

There were times when it seemed that all the Roman armies had achieved must be lost in the risings that would of a sudden

*See *Julius Cæsar*, by John Buchan.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flame across Gaul in slaughter and pillage. Only Cæsar's military genius and dogged persistence finally triumphed; and Vercingetorix marched to the Forum not at the head of his armed tribes but in chains.

Cæsar as a Statesman.—Superb as a soldier, it is more difficult to estimate Julius Cæsar as a statesman. In city politics as leader of the democratic party (Populares) as opposed to the aristocratic classes (Optimates) he knew how to keep his name before his following by judiciously bestowing the *panem et circenses* which they preferred to any reform of the *comitia publica*.

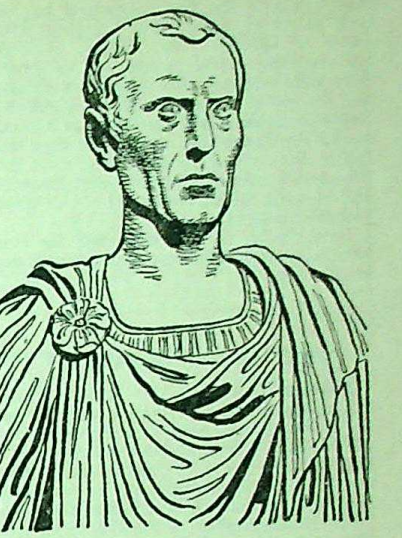
During the Sicilian War the first exhibition of gladiators had been held, but later this combat of a few couples degenerated into miniature battles involving the deaths of hundreds of slaves and prisoners of war. Cæsar, humane and fastidious in his personal approach to life, accepted this public, with its primitive blood-lust, as he found it. For the more intelligent he wrote his military autobiography, ostensibly a straightforward narrative of his campaigns but also something of a political pamphlet.

Crassus had died in the East, and now it was to be a duel between the former allies, Pompey and Cæsar. Pompey had secured the Senate, and the Senate ordered Cæsar, who was in Cisalpine Gaul, to disband his legions and come to Rome as a private citizen. To comply meant the extinction of all his political ambitions, probably of his life, so Cæsar instead crossed the River Rubicon with his army and marched south, as Sulla had done before him. He drove Pompey and his Senators not only from Rome but out of Italy, and then, with the deadly swiftness of a hawk, struck down those who rose to resist him in Spain.

Pompey was in Greece, and at Pharsalia, in Thessaly (48 B.C.), the rivals met, the once "fortunate" being utterly routed, so that he fled to Egypt only to be murdered on his landing there. His victor followed him, remaining some nine months with his headquarters at Alexandria, in thrall, it was said, to the charms of the young Queen Cleopatra, the last of the Ptolemies.

From Egypt Cæsar passed to Asia Minor, sending back to Italy an account of his triumphs there in the well-known phrase, *Veni, Vidi, Vici*—"I came, I saw, I conquered."

Master of the civilized world, he could on his return to Italy do as he chose with Rome and its Senate, or so it seemed to those such as Marcus Brutus, who believed he intended to make himself a king. A conspiracy was hatched amongst many who had in early days been his friends, and in March, 44 B.C., just before he was starting on a campaign against Parthia, Cæsar was murdered in the Forum, leaving unsolved the problem of how he would have "moulded the sorry scheme" of republican Rome "nearer to his heart's desire."



Julius Cæsar, drawn from a bust in the Capitoline Museum, Rome

If any vision of kingship had really dazzled him it was Alexander's Hellenic Empire, but set on a solid Roman foundation of well-paved roads and provincial cities linked together in an organized system of local government. His mantle, both as soldier and reformer, fell on the shoulders of his grand-nephew Octavian, a youth of eighteen, who with Marcus Antonius, his chief supporter, avenged Cæsar's death on the conspirators at Philippi (42 B.C.).

Last Years of the Republic.—After Philippi, the Roman dominions were divided between the victors, Mark Antony departing to the East and Octavian remaining in the West nominally as the servant of the Senate. A man of tact, he soon persuaded that almost moribund body that the luxury and pomp maintained by Antony in Alexandria, where he was now the consort of Cleopatra, were a menace to the republic's authority.

Once more civil war broke out, and at Actium, on the coast of Greece, the rivals met (31 B.C.). The battle was fought both by sea and land. The fortunes of the day began to go against Antony, and Cleopatra,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

who was with the fleet, persuaded him to seek safety in flight, thus bringing their cause to hopeless ruin. Later, as both realized their fate would be to grace Octavian's triumph, they committed suicide, and the heir of Cæsar was left master of the Roman dominions. But the Battle of Actium marks more than this mastery, or than the fall of Antony and the Ptolemies. It is the line drawn between Republic and Empire, and between the ancient world of the West and the medieval.

Incidentally, for the first time for two hundred years, Rome was at peace with the world.

XVIII

ROME IN HER GREATNESS

Augustus Cæsar (*d.* A.D. 14).—Octavian had marched against Marcus Antonius as the servant of the Senate; and now on his return, while the crowds in the streets were still hymning his victory as though he were a god, he quietly surrendered his command into the hands of those who had bestowed it.

In this assumption of humility lay a gift of conciliation that the great Julius had lacked. The Senate, secretly aware of its own fatuity, was anxious merely to retain the trappings of power. In 27 B.C. it created a Principiate with Octavian as Princeps (First Citizen). He was also elected Tribune and confirmed in his "imperium" or supreme military command. The special title of August was bestowed on him; and as Augustus Cæsar, first Emperor (Imperator), his name lives in history.

The Government of Augustus. — The republic on its administrative side had been not merely corrupt but badly planned, lacking the centralized purpose which under Darius the Great had so successfully directed from Susa the affairs of the Persian satrapies.

In the time of Augustus we can for the first time glimpse the law and order that our minds instantly connect with the word "Rome."

The Senate was still honoured and consulted, but its chief work now was merely to register imperial edicts. The Emperor's law-courts, too, gradually drew into their net cases of vital importance to the state, creating in time a body of scientifically trained jurists, ready to supply their royal master with professional advice. In the words of Professor Barker, "it was the legal genius of Roman citizens . . . which gave to the Empire the framework and structure of its institutions."

This new government appeared to rest on the popularity of Augustus; but it was in point of fact a military conception. Behind its emperor stood massed the Legions, and in the Palace the cohorts of the Prætorian Guards, whose presence dominated the ordinary citizen and senator alike. Later, this pampered body of troops was to make and unmake emperors at will. Under Augustus it knew its royal master's voice, and enabled him to check the civic anarchy that had constantly disgraced republican Rome.

The Government of the Provinces. — Augustus, a lover of peace, though his power rested on his imperium, made little or no attempt to push the boundaries of the Empire farther than the Rhine and Danube in the north, or beyond the Euphrates in the east.

Within those boundaries he travelled widely, like Alexander laying the foundations of imperial cities that were to be connected with his capital and civilized by well-laid Roman roads. It was during his reign that Lugdunum (Lyons) became the centre of three Gallic provinces and the second most important city of the world-empire.

In the provinces, where during the republic annually elected Consuls had been quite unable to control rapacious Governors, he now made those officials responsible to himself, removing any who displeased him and advancing others who had carried out his will.

Except in Palestine, always irreconcilable to foreign domination, this one-man rule was not unpopular, for the Romans had learned the lesson of their Social War, and citizenship was granted to all who could pay the price, either in money or by service in the Roman Legions. Very proud was the Roman-born to be a son of this universal empire, loved as much for her even scales of justice as for her glory and wealth.

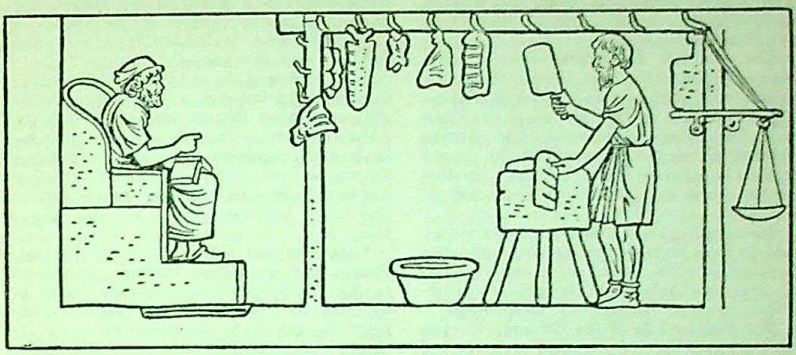
The Augustan Age.—Augustus boasted that he found Rome brick and left it marble. On the Palatine hill he built a palace with a colonnaded temple to Apollo, while below there arose Senate House and Law Courts, the Theatre of Marcellus, public baths, and obelisks brought from the East.

The fire of Nero's reign was to destroy much that had been erected; but the inspiration that made Rome a fitting capital for her mighty empire came from the first of her emperors.

On the Palatine, alongside the royal palace and Apollo's temple, was an immense library, for Augustus the architect was also a patron of learning. Under Greek influence Roman culture had steadily developed. Julius Cæsar himself had deigned to be an historian, and during her last years the Republic had numbered many

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Roman pork-butcher's shop, from a cast of a relief by courtesy of the British Museum

distinguished men of letters amongst her citizens. The chief of these was Cicero (*d.* 43 B.C.), the orator and letter-writer who, in the Latin prose he had perfected, wrote of the literary studies he pursued, "they increase happiness in good fortune, they are in affliction a consolation and refuge; they give us joy at home, and they do not hamper us abroad: they tarry with us at night-time and go forth with us to the countryside."

Cicero was a believer in republican ideals, and had shrunk from what he guessed were Julius Cæsar's monarchical ambitions; but those who succeeded him as leaders of the cultured world during the first years of the Empire were steeped in its glory and in admiration for its founder.

It was a period of great public joy and confidence (it may be compared in that respect with the Periclean and Elizabethan Ages), and men made research amid the legends of a past Rome to find the promise of her present triumphs.

Livy, the historian (*d.* A.D. 71), composed on his 142 rolls of papyrus a wonderful piece of Latin literature devoted to a wholly unreliable history of his city from the earliest times; while Virgil, the poet (*d.* 19 B.C.), delved back as far as the Homeric tales to rescue the "Pius Æneas" from a burning Troy and send him forth, the hero of his *Æneid*, to found an even mightier city among the Latin hills.

Virgil was born at Mantua, and was a lover of the countryside as well as of war and adventure. In his *Georgics* his aim "was to describe with realistic fidelity, and to surround with an atmosphere of poetry, the annual round of labour in which the Italian yeoman's life was passed."

Another poet of this age was Horace (*d.* 8 B.C.), author of the *Odes*, who also wrote "satires" on the life of Rome in his day. Though he had been a republican, supporting Brutus at Philippi, he took advantage of the amnesty offered later and allowed himself to be won over to the new regime by Mæcenas, who was the friend of Augustus and the wealthy patron of men of letters.

The Julian Emperors.—The Emperors who followed Augustus and claimed to be of the same Julian line either by birth or adoption were Tiberius, Caius Caligula, Claudius and Nero.

Of these, Tiberius (A.D. 14-37) and Claudius were both able rulers who enriched Rome with fine buildings. Claudius (A.D. 41-54) visited Britain and made the southern part of that island a province of the Empire. He added Thrace to Roman Greece, and at home built two huge aqueducts by which fresh water was brought from the hills into the city.

During the reign of Nero (A.D. 54-68), a large part of the new magnificent Rome was burnt to the ground. It is more likely that the Emperor tried to extinguish the flames than fiddled; for, if a Bohemian, he was no fool, and had shown promise at first of doing credit to his wise tutor, Seneca the Stoic.

An exaggerated belief in his own gifts as a star performer in the arena and theatre, and an insatiable appetite for admiration turned him from a well-meaning young man into a vicious monster, responsible for the deaths of his mother, wife and a number of the leading senators, as well as of many of the Christians in Rome, whom he accused of incendiarism.

When a revolution against his tyranny proved successful, he is said to have taken his own life with the greatest reluctance, saying: "What an artist dies in me!"

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

With these words, not before it was time, the curtain rang down on the tragedy of the House of Julian.

The Flavian Emperors.—Out of civil war emerged a Flavian dynasty from the provinces in the person of the rough soldier, Vespasian (A.D. 69-79), and his sons, Titus and Domitian. Vespasian had distinguished himself in command of the second legion in Britain under Aulus Plautius in the years A.D. 43-44, in the reign of Claudius.

Titus (A.D. 79-81) conquered Palestine, which had blazed into revolt, and took Jerusalem after a prolonged siege. The Temple was sacked and the golden candlesticks carried away to grace his triumph.

The Golden Age of the Empire.—To the period stretching from the accession of Nerva (A.D. 96-98) to the death of Marcus Aurelius has been given the title "Golden Age."

During the reign of Trajan (A.D. 98-117), the legions advanced the boundaries of the empire to their widest extent, incorporating Dacia (Roumania) and in the Orient even gaining temporary possession of Armenia, which had been long disputed with the Parthians.

Hadrian (A.D. 117-138), came to Britain and built a wall from Tyne to Solway as a protection against Picts and Scots. He also completed the line of fortifications begun by Trajan from Rhine to Danube, ever the weakest section of Rome's northern frontier. Such measures restored to the Empire the prestige it had enjoyed under Augustus.

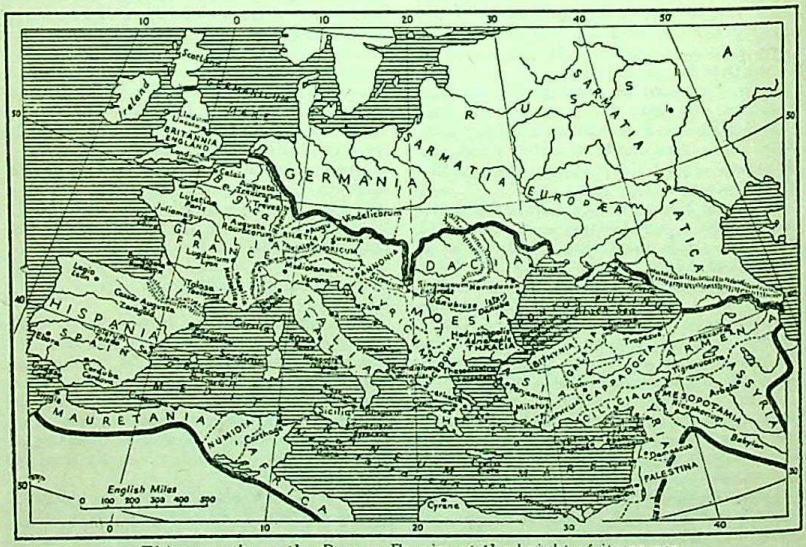
"Be it thine, O Roman, to govern the nations with thy imperial rule."

So Virgil had sung, and if the gloomy historian, Tacitus (*d.* A.D. 120), unfavourably contrasted Roman corruption with the simple customs of the Teuton tribes massing beyond the northern outposts, an ordinary citizen realized that in all the world before his day there had been no counterpart to the peace and prosperity he saw about him.

Today we can still see part of Trajan's Forum and walk past Hadrian's tomb in his fortress by the Tiber, now the Castle of St. Angelo. The greatest monument of this reign is, however, the Pantheon with its huge concrete dome.

The Pont du Gard, near Nimes, in southern France, was built by Antoninus Pius (A.D. 138-161), and has aroused the admiration of each succeeding generation. Its three tiers of massive stone arches reach a height of 160 feet.

In literature, apart from Tacitus, the chief names are those of Plutarch (*d.* A.D. 120), whose "lives" of great men were to inspire Shakespeare's dramas; Pliny the elder, scientist and author of the encyclopædic *Natural History*; and his nephew, Pliny the younger (*d.* A.D. 113), Governor of Bythinia, who corresponded with the Emperor Trajan on the vexed question of what to do with obstinate Christians.



This map shows the Roman Empire at the height of its power

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

XIX

THE DECLINE OF ROME

The Emperor Diocletian (A.D. 284-305).—One reason why Rome, which had seemed immortal, fell at last was that the Barbarians in overwhelming numbers were knocking at the gates not only of her northern frontiers but of those in the East as well. Here the Parthians had been conquered by the Sassanids, who made their capital at Ctesiphon, on the Tigris. This new Persia, as it expanded westwards, proved a very dangerous rival to Rome.

The Emperor Diocletian was forced to establish his headquarters at Nicomedia, in Asia Minor, and to deal with imperial business in the West he appointed a joint emperor to rule at Milan. He also settled that to avoid disputed successions each "Augustus" would choose a "Cæsar" as his legal heir to step into his shoes on his death.

This was an indication of the future division of the Empire into East and West, though the intention of Diocletian had been merely to make a workable government. He saw that the Sassanid dynasty was, through its absolute authority, in a very strong military position, and so he proceeded to "orientalize" his own empire. Up till this time the shadowy dignity of the Senate had always received a certain "lip-service." Diocletian brushed such sentiment aside, the fiction of Roman democracy ceased, and Rome herself lost her privileged position and became subject to the same scale of taxation as other provincial cities.

Government of the Later Roman Empire.—Under Diocletian with his fellow Augustus at Milan and two Cæsars, each surrounded by a Court and army of officials, the burden of bureaucracy became alarmingly heavy; and there were even ominous whispers that the State might go bankrupt. Her principal source of revenue was a land tax, whose collection was left to the curiæ (local councils), each being assessed by the government at a certain sum. Since they were unable to compel local magnates to pay their share, these tax-collectors exacted the amount from their poorer neighbours, giving rise to the saying, "so many curiales, so many fobbers." In the fifth century we read, "the name of Roman citizen, formerly so highly valued . . . is now regarded with abomination."

Many of the curiales, themselves oppressed and overburdened, took to brigandage, or voluntarily surrendered their freedom to become dependents of some neighbouring lord's villa. These villas were entirely self-sufficing, since between the labours of freemen and slaves they provided their inhabitants with all the food, drink and clothing they required. In type they bore a strong resemblance to the fiefs of an earlier Egyptian or later medieval stage of civilization.

In Rome and other large cities the proletariat had been increasing steadily, since it was continually swollen by deserters from the decaying land-system. The greater part, unable as in republican times to compete with slave labour, existed mainly on free distributions of corn, and was kept from exhibiting violent discontent by gladiatorial shows. Some idea of the crowds that would turn out to watch the latest spectacle can be pictured from the size of the Colosseum, the big amphitheatre built by Vespasian.

The worst symptom of this declining Rome was that scarcely any of her citizens, rich or poor, wished for the radical reforms in organization and economy which alone could have saved her. Yet a few earnest minds were at work seeking some better way of life, public and private, than a riot of extravagance and Epicurean indulgence.

Religions of the Later Empire.—Zeno the Stoic had still his followers, and a disciple in one of the best of the emperors, Marcus Aurelius (121-180), whose *Meditations*, still read in the twentieth century, reveal the ordered rationalism natural to the Roman mind. Greek speculation and oriental mysticism were alike given tolerant consideration in Rome as they had been in Alexandria, but in the cultured Latin mind they woke by this time little real response. Cæsar-worship, adopted from Egypt and the East, was a political convenience, and the incense offered at imperial altars made rather a test of loyalty than of piety or orthodox beliefs.

Thus a Roman mob, sensation-mongering, could enjoy strange oriental "mysteries"; the legions, who had picked up the Zoroastrian worship of Mithra (Light) from their Persian foes, sacrificed bulls in his honour; the Christians under certain conditions could have held the love-feast of their crucified Saviour. All was permitted so long as Cæsar and the deities of Rome Triumphant also maintained their place of honour. It was because Christianity brooked no divine rival that emperors such as Trajan and Marcus Aurelius followed the example of Nero in persecuting its converts.

Early Christianity.—Jesus of Nazareth, the young Jewish prophet whom His followers called "the Christ" (Anointed One) and claimed to be the Messiah, was born in the reign of Augustus. Yet this first emperor and his immediate successors probably never even heard His name; for early Christianity did not advertise itself with trumpets, nor entice worshippers with intriguing mysteries and ritual. It was a moral code supported by the promise of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

hope of another and better existence that made an irresistible appeal to those weary of paganism or unfortunately placed in this world.

Notwithstanding the cruel persecutions of the early adherents of the new religion, its hold on the hearts and souls of numbers of ordinary men and women became well established. The earliest Gospel (Good News), that of St. Mark, was probably written between A.D. 60-70, the accounts of the other two Synoptic Gospels being partly based on it a few years later. Prophets and would-be Messiahs had been of frequent appearance in Palestine, but what was unusual and arresting was that this present Teacher, rejected and even crucified through the fanatical hatred of His own race, was within a few generations accepted as "Lord" by the Hellenized world of the Near East.

The fourth Gospel, that of St. John, is permeated with Hellenic mysticism. "Humanity," says Renan, "seeks the ideal, but it seeks it in a person and not in an abstraction." Thus the nebulous Greek "Logos" (The Word) of the philosophers "became Flesh"; and Paul of Tarsus ("the first great Christian missionary and theologian"), reacting to his Græco-Roman environment, proclaimed his "God made Man" as the central fact of the new Faith, "One whose person was greater than His teachings."

Herein lay the underlying strength of early Christianity. In the creed "Jesus is Lord" there could be no compromise, and against the constancy of those who held it imprisonment, torture and massacre did their worst in vain.

XX

CONSTANTINE THE GREAT

As Christianity began to make converts, it was found necessary to organize a Church (Ecclesia), and overseers (episcopi = bishops) were appointed with priests (presbyters) and deacons under them to carry out their orders. By the fourth century these bishops had become important officials, whose power must be taken into account by pagan governments of the day.

Tradition declares St. Peter to have been first Bishop of Rome, crucified during Nero's persecution, also that he was a friend of St. Clement, who afterwards succeeded to that office. It was an early custom of the Church to call a bishop "Pope" (Pater = father), but in time this title was reserved in the West for the Bishop of Rome (Il Papa), whom citizens soon regarded as their king, since emperors had gone to live elsewhere.

Constantinople (Byzantium).—The declining importance of the city of Rome was partly due to geography; since, though the site had proved eminently suitable for the government of Italy alone, Milan, within easy distance of the Alpine passes, was far more accessible from the point of view of the Empire. There was also a change of outlook. Since the election of Vespasian many of the emperors had been provincials without any feeling of the sacredness of Rome; Diocletian, for instance, for military reasons preferred to live in Nicomedia.

In the fourth century there appeared an Emperor, Constantine (A.D. 306-337), who, born in York and succeeding his father as ruler of Spain, Gaul and Britain, could never from the first have visualized Rome save as the capital of his rival Maxentius. When he had defeated Maxentius, and also Licinius who was ruling in the East, Constantine was lord of the whole Roman world; but he did not choose to live in Rome. Instead, he built himself a beautiful capital at Constantinople, on the European side of the Bosphorus, where the Greek colony of Byzantium had once stood, and set up a golden milestone to show that this was to be the centre of the civilized world.

From a strategical point of view he was right. Constantinople withstood the assaults of pagan barbarians for over a thousand years: Rome opened her gates to the Goths in less than a hundred; but to that unity of civilization which the Empire once represented, the change of capitals was to prove disastrous. From the founding of Constantinople (330), the rift between East and West widened steadily, until in the Middle Ages there were two Empires, each claiming to be the one descendant of "immortal Rome," and two Churches declaring that they alone had received the authority of Christ and His Apostles.

Constantine and Christianity.—Regarded through western eyes Constantine, instead of being labelled "the Great" might have passed down to history as "the Bad," had it not been that he changed the course of European civilization by becoming a Christian. He was not actually baptized till near his death, but his mother, St. Helena, was an ardent convert, and from the time he became sole emperor he showed marked favour to the hitherto struggling Church, although in his Edict of Milan (A.D. 313), published just after his conquest of Rome, he had merely granted toleration to all the religions of the Empire alike.

Christianity in the Fourth Century.—Persecution had bred in the early Christians courage and loyalty, but it had not tended to make them tolerant, or to develop the gentleness that had characterized their Founder. From the moment pagan

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

coercion ceased, differences of opinion on doctrine broke into furious controversy.

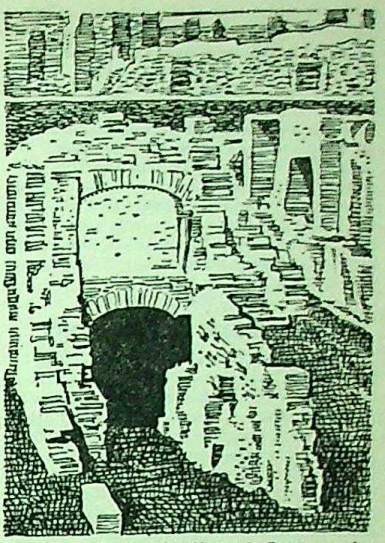
The simplest expression of Christian belief was the Apostles' Creed (Apostolicum),* but before this took shape, some of the early Fathers of the Church were insisting on exact definitions of the nature of Christ and of the Trinity. There was an embittered dispute on the former question between Arius, a presbyter of Alexandria, and his bishop; and finally a council was held at Nicæa (A.D. 325), presided over by Constantine, to decide the matter. Here the views of Arius were declared heresy, and the Nicene Creed was drawn up as the belief of the orthodox Catholic (Universal) Church. This was chiefly due to an impassioned denunciation of Arius by a Greek priest, Athanasius, whose name the Church at a much later date affixed to yet a third Creed.

The Arian heresy rent Christendom, for the Egyptian priest did not accept his condemnation but continued to preach and win over converts, arousing the sympathy of Constantine himself, who tried to suppress his rival Athanasius. It was from Arian missionaries that a number of the Gothic tribes learned of the new Faith.

Early Monasticism.—Monasticism originated in the East, where ascetism and religious zeal are usually allied. The world of the fourth and fifth centuries, though Christian in name, had not yet rid itself of the pagan licence of declining Rome. Thus some of the more spiritually minded converts determined to live apart from the world, hoping either to pray and meditate more easily in solitude or else by some act of public mortification to awake those who saw them to the need of repentance. St. Simeon Stylites (*d.* A.D. 399) spent thirty years on a high pillar at the mercy of wind and rain.

St. Basil (*d.* A.D. 399), one of the most formidable opponents of Arianism, formed a community of monks near Pontus, in Asia Minor, and here also for a while lived the theologian St. Gregory (*d.* A.D. 396). Amongst these early Fathers, who by their writings laid the foundations of Christian theology, were Origen (*d.* A.D. 254), "the most prolific author of the ancient Church," and Tertullian (*d.* A.D. 222), who "in fact created Christian Latin literature" by writing mainly in that tongue.

St. Jerome (*d.* A.D. 420), although born in Dalmatia, was early attracted by Eastern asceticism, and went from Rome, where he studied, to Palestine, settling finally at Bethlehem with a large number of converts who included some of the wealthiest ladies in Roman society. St. Jerome's life-work



Remains of the Gladiators' Room under the floor of the Colosseum, Rome

was to translate the New Testament into Latin, and his Vulgate became the authorized version of the Catholic Church.

Temporary Reaction against Christianity.—Western civilization was destined to be Christian, but inevitably its first triumphs suffered reaction. The Emperor Julian (*d.* A.D. 363), nephew of Constantine, gained for himself the title "The Apostate" by renouncing Christianity and attempting to revive Hellenic paganism.

He was the last of the Roman Emperors to oppose Christianity itself, though many were to quarrel with the Church's accepted leaders on matters of authority. In the West there could not be the same unquestioning loyalty to rulers of Constantinople as in the East; and St. Ambrose, Bishop of Milan (*d.* A.D. 397), had popular support when he defied the edicts of Theodosius. He has been described as "a man of pure character, vigorous mind, unwearying zeal and uncommon generosity." When some of his flock were carried off by the Barbarians he did not hesitate to melt down the Church plate to pay their ransom.

One of the students who visited St. Ambrose in Milan was a young Numidian, Augustine, who after a wild youth had been converted, as he declared, by the prayers of his mother, St. Monica. After studying in Italy, he returned to North Africa, where he became Bishop of Hippo. Of his writings the best known are his *Confessions*, a

* Derived from the Confession of Marcellus of Ancyra, A.D. 340

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spiritual autobiography, and his *Civitas Dei*, evoked by the news that Rome "the immortal" had been taken by Barbarians. "Who would believe," wrote St. Jerome from his cell at Bethlehem, "that she would one day fall?"

Pagan reactionaries declared it was because she had forsaken the old gods. St. Augustine (*d.* A.D. 430) took up the challenge, bidding men look from the earthly city Rome, doomed to crumble, to a *civitas dei* built by God and everlasting. His book has been found to be a key that opens the door of medievalism.

XXI

THE BARBARIAN INVASIONS

The Goths.—The Goths were on friendly terms with the Roman Empire, and their savagery was mitigated by contact with Roman culture. They began to imitate Roman institutions and customs, and many of them became converted to (Arian) Christianity. They were driven from their homes north of the Danube by the invasion of the Huns, and sought protection from the Eastern Emperor, Valens, who grudgingly allowed them to occupy the province of Dacia. Starvation and misery led the Goths to rebel against the Emperor, and at last they formed an army, and met and defeated the Imperial forces at Adrianople in 378, Valens himself being slain.

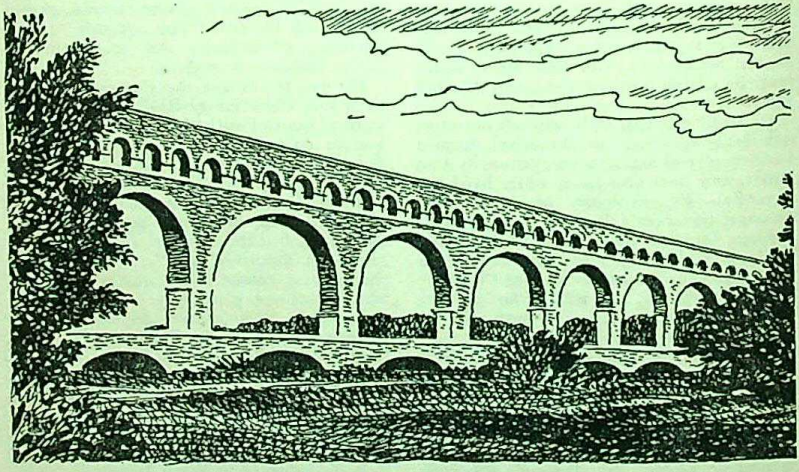
The Battle of Adrianople was a smashing blow to the Eastern Empire, but worse was to befall in the west, for in 410 a great host of the Visigoths came sweeping across the Alps and bearing down upon Rome. Their leader was Alaric, most competent of Barbarian generals, and he led his men into the city with scarcely a blow. Alaric would not allow indiscriminate slaughter or looting; he was no savage, nor were the Visigoths mere destroyers, like the Huns. When St. Jerome heard of the sack of Rome he exclaimed: "that city is subdued which subdued the world," and lamented the happening as though the end of the world were at hand.

Soon after his triumph, Alaric died, and his successors moved westwards into Gaul and Spain. The Visigoths founded the kingdom of Toulouse, which merged into the Frankish kingdom during the sixth century, and others made their homes in Spain, choosing Toledo for their capital, until they were conquered by the Mohammedans.*

In Eastern Europe, the East Goths, under their famous ruler Theodoric (493-526), allied with the Vandals, and established their dominion over north-eastern Italy. Theodoric was a most enlightened and civilized man, and he proved himself a far-seeing ruler in combating the rising power of the Franks.

Vandals, Burgundians, and Alemanni.—Meanwhile, the Vandals who had settled in Spain, crossed over to Africa, and founded an empire on the northern coast, which was ultimately destroyed by Justinian (527-565). The Vandals developed their sea power, and conquered many of the Mediterranean

* See Chapter XXIV.



Pont du Gard, which is situated near Nimes, in southern France. The aqueduct was built in the reign of the Emperor Antoninus Pius, A.D. 138-161

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

islands; they were pirates by temperament and choice, and were found to be less amenable to civilization than their Gothic neighbours.

The Burgundians moved (*c.* 440) into the lands to which they have given their name, the later Duchy and County of Burgundy, while the Alemanni occupied lands north and south of the Rhine which they had just left. All these migrations were caused by the Huns, who were rapidly pushing their way westward, destroying as they came.

The Huns under Attila.—The invasions of the Huns were the greatest danger civilization had yet known, for they were the worst type of all barbarians, ignorant, destructive, and inhumanly cruel.

In the year 451 the Huns under Attila swept into Gaul, ravaging the country as they went, and making their way as far as Orleans, which they unsuccessfully besieged. The Franks, the Goths and the Burgundians allied with the remnants of the Roman armies under a Roman general, in a desperate effort to answer this challenge to civilization. The Huns were defeated at Châlons-sur-Marne, and forced to withdraw from Gaul. They turned their attention to Italy, and ravaged the country round Aquileia. In 453, when Attila died, their power ebbed away.

Europe had been threatened with the destruction of all civilization, just as she would again be threatened by the Mongol hordes in the thirteenth century, but this alliance between Romans and romanized barbarians had averted the danger. Roman provincials like Apollinaris Sidonius might complain that the Burgundians were vulgar fellows who greased their hair with rancid butter, but there could be no doubt that Roman culture was conquering those who had themselves conquered Rome.

The Conversion of the Barbarians.—Most of the barbarians held to a vague and eclectic form of religion, and as soon as they came into contact with Christianity they were readily converted, though they found it hard to lay aside wholly their pagan practices and ideas. Many of the East Goths professed Arian Christianity by the end of the fourth century, and some followed Nestorius (*d.* 452) and set up Nestorian communities, which spread rapidly in Asia and India. By the middle of the sixth century Nestorian Churches could be found in Ceylon, Malabar, among the Huns, in Mesopotamia and in all lands east of the Black Sea.

About 432 the Irish had been converted by St. Patrick, and they in their turn proved the most enthusiastic of missionaries. Most famous of all was St. Columba (*d.* 597), who founded in Iona the central mission station whence missionary teachers went out to convert the British driven westwards by Anglo-Saxon invaders. The Anglo-Saxons were themselves converted to Christianity by St. Augustine, who landed in Kent in 597. He had been sent by Pope Gregory the Great (590-604), and he met with striking success owing to the help of the Frankish princess Bertha, who was the wife of Ethelbert, King of Kent.

Ethelbert feared lest Augustine and his followers should practise magical arts upon him, so he received them out of doors. "But they came endued with Divine, not with magic power, bearing a silver cross for their banner."* The King and all his subjects became Christians, to the joy of Queen Bertha, and soon other Saxon rulers followed suit.

Pope Gregory also reconciled the Arians in Spain to the Catholic Church, and he persuaded the Lombard king to be baptized. Gregory was a charming and persuasive man, as well as a very learned one; perhaps this accounts for part of his success, for it is possible that no man ever won more souls for Christ.

Before long the Anglo-Saxon Church was sending out missionaries to convert their kinsmen in the Netherlands and Germany. One of the earliest of these was Willibrord, who went to Frisia in the year 690. A few years later, in 716, Winfrith of Crediton, more often known as St. Boniface, left his Devonshire home to take up missionary work in Germany. He gathered disciples round him and built churches and convents, and he organized bishopries under the archbishopric of Mainz.

At the Pope's request he visited the Franks, and helped them to reform their Church, and then, as an old man, he went to preach to the wild tribes in Friesland. These would not hear his message, and put to death the "Apostle of Germany," but his work was done. No one man has ever done more to Christianize and humanize savage tribes than this gentle west countryman, and he had the satisfaction of achieving substantial and permanent results during his lifetime, and in his death he joined those who have given their lives for their faith.

XXII

THE BYZANTINE EMPIRE

The Empire from Constantine to Justinian. — Constantinople, more often known to medieval folk as Byzantium,† soon became equal to Rome in size and population, and more than her equal in wealth. Ships of all countries came to her excellent harbour, bringing products from

* Bede. *Ecclesiastical History.*

† It is called "Byzantium" in this Outline until its capture by the Turks in 1453.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

both East and West, and Byzantium was, throughout the early middle ages, the richest city of the Christian world.

Under Julian "the Apostate" (361-363) came the final assertion of paganism. Julian repudiated the Christianity he had once professed, and devoted himself to Greek philosophy, but when he died—and legend has it that his dying words were: "O, Galilean, thou hast conquered!"—Christianity was restored as the official faith of the Empire, and paganism faded into the background.

After the skilful Theodosius I (382-395) had died a final severance between East and West took place. The Western Empire became the prey of the barbarians, and although the line of Emperors lingered on until 476, their power was a mere shadow. With the deposition of Romulus Augustulus in 476, his power was nominally transferred to the Eastern Emperor, but this was a transference of a ghostly, not a material, authority. For some years at the end of the fifth century it seemed probable that the Byzantine Empire would be overrun by the East Goths, but they passed on towards Italy and the Empire was saved.

The Reign of Justinian, 527-565.—"The Emperor Justinian," wrote his biographer, Procopius, "succeeding to the throne when the state was decayed, added greatly to its extent and glory." No detail was too small for Justinian's supervision, and he used to spend whole nights working out his schemes, or pacing the halls of his palace wrapt in thought, for daylight hours were too short for all the work he wished to do. Finance, law, engineering, music and theology he studied with the greatest industry and application.

Above all, Justinian is famed for his work in examining and codifying Roman law, the "Corpus Juris Civilis" which he compiled, and which profoundly influenced the whole course of Civil and Canon Law. Procopius says that "finding the laws obscure through their unnecessary multitude, and confused by their conflict with one another, he firmly established them by reducing the number of those which were unnecessary, and in the case of those that were contradictory, by confirming the better ones."*

To his contemporaries, Justinian seemed scarcely human, yet he married (to the horror and scandal of his court) the beautiful and talented courtesan Theodora, who overcame criticism by her model behaviour as Empress. All through his reign Justinian manifested the greatest passion for building. He built a great number of churches in his dominions, and harbour works and bridges, forts and palaces. He arranged a scheme for the water supply of Byzantium, in which great cisterns were to be provided to store the water in time of plenty, and personally supervised its details. He built a convent for reformed prostitutes, he rebuilt the Emperor's Palace, and above all, he built the great church of Hagia Sophia (generally, though incorrectly) known as "Saint Sophia."

For this church materials were brought from every corner of the Empire, and the two most skilled architects of the day were employed in its construction. Porphyry was brought from Egypt, and marble columns from Ephesus and from the Temple of the Sun at Rome, gold, silver and precious stones—nothing was too good for this church with its beautiful mosaic-covered dome, and its exquisite carvings and inlay of precious marbles. When the great work was finished, and Justinian drove up in his chariot to open "Saint Sophia," bystanders heard him murmur: "I have surpassed thee, O Solomon!"

Justinian's ambitions did not stop short here; he was engaged in an almost continuous war with Persia, and he dispatched a fleet and troops to fight the Vandals in North Africa. He was able to add the whole North African coast line and part of Spain to his dominions, and then turned his attention to Italy. At Ravenna, where the last of the Western Emperors had held their court, Justinian built the church of San Vitale, where mosaic portraits of himself and Theodora are still to be seen. Ravenna was ruled by a viceroy, named an Exarch, and remained under Byzantine rule until the middle of the eighth century.

Justinian did what he could to promote the welfare of his people; for instance, it was due to his enterprise that silk-worms were brought from China (probably by Nestorian monks) concealed in walking-sticks, and so was begun that silk weaving which afterwards became one of Byzantium's most famous industries. On the other hand, Justinian's great schemes and his wars were so expensive that the people groaned under a crushing load of taxation, and the resources of the Empire were crippled, leaving his successors a legacy of debt.

The Empire after Justinian's death.—Justinian left his successors a great heritage, but not the means of keeping it together. Most of his Italian conquests were quickly lost, although Byzantine power there was not completely destroyed until the Norman invasion of the eleventh century. (See Chapter XXVI.) The Lombards in the seventh century invaded northern Italy, while the Mohammedan conquests (see Chapter XXIV) took from

* This and the previous extract, are taken from *The Buildings of Justinian* translated by Aubrey Stewart

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the Empire its lands in North Africa and Spain, and before long (675) the Moslems were besieging Byzantium itself. After the first wave of conquest had subsided, the Byzantine Empire recovered something of its former influence, but nothing of the lost territories. Finally, it was a Christian onslaught which brought it ruin, when the Crusaders sacked Byzantium in 1204 (see Chapter XXX) and so weakened the Empire's defences that in 1453 it fell an easy prey to the Turks, who had been devouring it piecemeal for a century.

XXIII

THE KINGDOM OF THE FRANKS

The Merovingian Kings.—The Salian Franks, a tall, blond race of men who worshipped Teuton gods, had settled in the lands known to us as Belgium. They were ruled by a member of the house of Meroveus, and no Merovingian king could reign who had suffered his locks to be shorn, for long, flowing hair was, in the Frankish view, a sign of royalty.

From Belgium the Franks advanced through Gaul, conquering as they went, and by the sixth century they were firmly established. They had their own code, or Salic Law, under which they lived. When the most famous of Merovingian kings, Clovis (481-511), married a Christian princess, he allowed her to keep her religion, and when a son was born he, too, was allowed to be a Christian, but for a long time Clovis clung to his old pagan beliefs. At last, however, when he was hard-pressed during a battle, he cried out that if Christ would bring him aid, he would be baptized. Clovis won the battle, and kept his promise; and he and 3,000 of his men were received into the Christian Church at Rheims in 496. In this way the people of the Franks accepted Christianity.

Clovis himself remained pagan at heart, and retained all the savage cunning of an uncivilized ruler, but he had changed the whole course of the history of his people. He it was who chose Paris as the capital of his kingdom, and this, too, had far-reaching results.

The Carolingians. — The conquests of Clovis, at the expense of the Visigoths in the south, were continued by his successors, and the Frankish Kingdom reached the height of its power under King Dagobert (628-638). Soon after this the power of the Merovingian kings began to pass from them into the hands of court officials, until nothing was left to them but the royal title and the royal flowing hair and beard.

For some years the heads of the Carolingian family had held the office of Mayors of the Palace, who guarded the royal demesne lands and were in many ways far more important than the kings. Charles Martel (the "Hammer") was a splendid warrior, and won the gratitude of all Christendom as well as of his own people when he defeated the Mohammedan armies at Tours in 732 (see Chapter XXIV). He became a hero to the Franks, and his son Pepin "the Short" inherited much of his glory and all his ability. He succeeded in extracting from the Pope the non-committal remark, "He who possesses the authority should doubtless possess the title also"—and in 751 he cut the hair of the last of the Merovingian rulers, thrust him into a monastery, and reigned in his stead from 751 to 768. Thus the title as well as the power passed from Merovingians to Carolingians, who retained it for more than two centuries, until the last of them in his turn had to give way before a too-powerful vassal.

Hugh Capet and his Successors.—The great figure of Charlemagne (768-819) dominates Europe at the end of the eighth and beginning of the ninth century, but his career belongs rather to the history of the Empire than the history of the Franks. The Carolingian line became feebler and feebler, and the kings were quite unable to deal with the invasions of the Northmen, who were harrying the coasts, and who even ventured to attack Paris. It was the Duke of Paris, not the king of the Franks, who repulsed the savage invaders, and it was only his courage and enterprise which saved the capital.

In 987 the last of the Carolingian rulers of the direct line died, and the nobles were only too glad to elect Hugh Capet, the Duke of Paris, in his stead. Like the Pope in 751, in 987 the Archbishop of Rheims gave his sanction, saying "our crown goes not by inheritance, but by wisdom and noble blood."

Under the Capetian kings, who ruled until the middle of the fourteenth century, and who included such distinguished rulers as Philip Augustus (1180-1223), St. Louis IX (1226-1270) and the handsome but unworthy Philip IV (1285-1314); under these monarchs France grew into a compact state, no longer a loose collection of tribes owing nominal allegiance to a powerless ruler.

XXIV

MAHOMET AND THE RISE OF ISLAM

The Coming of Mahomet.—Long before the founder of Mohammedanism was born there (in the year 570), Mecca was a holy city. From very early times a temple had existed there, in which stood the black

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stone which was one of the gods the Arabs worshipped. Mahomet was the child of very poor parents, and it was not until he was forty years old that he made any mark, or attempted to proclaim his new religion, which he declared the archangel Gabriel had revealed to him. Some of his disciples went to Medina and preached the new religion there, and in 622 Mahomet himself fled from Mecca and sought refuge in Medina, where he was greeted with acclamations. The flight of Mahomet is known as the Hejira, and from this date Mohammedans reckon their time as from the Year One.

Soon, his disciples won a victory over Mecca, and Mahomet entered as a master of the city which had cast him out. Mahomet's religion spread like wildfire through the East, and when he died in 632 he was master of all Arabia. Mohammedanism owes much to the Jewish and Christian monotheistic beliefs, and like them it is the worship of the One True God. Honour and justice and obedience and charity were the foremost qualities taught by Mahomet, and the true Mohammedan is expected to make his pilgrimage to Mecca, to fast during the month of Ramadan, to give alms and to recite daily "There is no god but Allah, and Mahomet is his prophet."

In common with Christianity, Mohammedanism enjoins belief in life after death, and Abraham, Moses and Jesus are recognized as "Prophets." The Koran, or Mohammedan Bible, is a collection of the sayings and teachings of Mahomet, written down shortly after his death. It is read in the Mohammedan mosques, and passages from its pages adorn the walls. There is no provision in the Mohammedan creed for a priesthood to expound the doctrines of the creed, for it is a simple religion framed to appeal to simple men, and is not hedged about with ceremony. The muezzin from his tower, or minaret, above the mosque, merely calls the faithful to prayer five times a day; there is no elaborate ritual to be observed.

The Rule of the Caliphs. — When Mahomet died in 632, his conquests were continued by his successors, known as "Caliphs." By 643* the whole of Syria, Mesopotamia, Persia, Assyria and Egypt were all under Mohammedan (or Moslem) rule. The Moslems offered their enemies their choice between "Koran, tribute, or sword," and it was seldom that the third course was necessary. The Christians in Jerusalem were given special toleration, and allowed the custody of their churches (see Chapter XXX).

Under the successors of Omar, Moslem conquests spread yet further; eastwards to India and the River Oxus, westwards along the whole of North Africa. In the early years of the eighth century the Moslems crossed into Spain, and it is highly probable that they would have overrun France as well, had it not been for a stunning defeat at the hands of Charles Martel, Mayor of the Palace to the Frankish king. He overcame the Moslems at Tours in 732, and all Christendom hailed his victory, although the Moslems were very different from the barbarian hordes Europe had learned to dread, and from the savage Northmen who soon began to harry the coasts.

By this time, the Mohammedan Empire, or Islam, had grown so great and unwieldy that a certain amount of internal disunion was inevitable. About 760 the capital was shifted to Baghdad, and although the Caliph of Baghdad was recognized as chief, he could not control Africa and Spain from a capital so far away, and they grew almost independent. At last, in the tenth century, Caliphates were established at Cairo in Egypt and at Cordova in Spain.

The most famous of all Caliphs of Baghdad was Haroun-al-Raschid (786-809). Under his rule Baghdad reached its greatest height of prosperity and luxury. It was the centre of commerce for the whole of the Orient, and philosophers and poets thronged Haroun's court. The Caliph entered into communication with Charlemagne (see Chapter XXV) and sent him presents of spices and silks and jewels, an elephant, and a water-clock.

This Caliph is known to all readers of the stories of the Arabian Nights, which give a vivid picture of this, the golden age of Baghdad. "Sinbad the Sailor," too, belongs to this time, or a little later; his adventures are modelled on the career of one Suleiman the Merchant, who made his remarkable voyages through the seas round India and Malaya and the Spice Islands. Sinbad's "old man of the sea" was perhaps a Borneo ape.

The Turks.—Soon after the death of Haroun-al-Raschid, the Moslem Empire began to decline in power and importance. In the eleventh century the Seljuk Turks pushed their way into the Eastern provinces of the Empire, and in 1058 the Caliph of Baghdad was obliged to hand over to them his temporal power and to recognize their leader as Sultan. He himself retained only his religious primacy. Finally, in 1258, the last Caliph was put to death at the order of the Mongolian leader, the son of Jenghiz Khan (see Chapter XXXII).

The Turks were a very different type of people, ignorant, fierce and cruel, and they became a menace to the whole of western civilization. All through the Middle Ages

* When the Caliph Omar, who was Mahomet's brother-in-law, died.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they remained a constant danger and in the fourteenth and fifteenth centuries the Ottoman Turks—who had been driven from their homes by the conquests of Jenghiz Khan—crept slowly westwards, and at last, in 1453, succeeded in capturing Byzantium and establishing themselves in Europe. The only debt of gratitude that civilization owes to the Mongolian Tamerlane is that he delayed this event by some fifty years.*

Mohammedan Civilization. — Although Christendom had every reason to fear the savagery of the Turks, there were a multitude of things Christians could learn from the Moors in Spain and the Arabs of North Africa. The wisdom of the East, of Persia and India, was the inheritance of these Moslems, and to it they added a constructive skill and an appreciation of art and of learning peculiarly their own.

The Caliphs ruled their dominions with ability and enlightenment; their roads and their postal system could even compare favourably with those of ancient Rome, and they carried out great irrigation schemes, digging canals and building aqueducts to carry water to parched ground, making what had been stony or sandy waste land into fertile soil.

In architecture the Moors developed a graceful style of their own; many of their mosques and palaces still remain, with their courts and their cloisters and their minarets, encrusted with rich and effective ornament. The famous Alhambra, or red palace of Granada, is the greatest of all monuments to Moorish power in Spain.

The Moors had a great love for gardens, for flowers and sweetly scented shrubs and fountains of ingenious construction. Oranges and palms and almond trees and vines flourished exceedingly and the Moors grew crops of corn and flax and rice, and fruit of all descriptions for export to all other European countries.

It was the description he heard of the beauties and fertility of the Balearic Islands that induced James, King of Aragon (1213-1276) to undertake their conquest, and he was so delighted with the islands that he proceeded to conquer the Moors in Spain as well, leaving them only the province of Granada, which they retained until 1492.

In scholarship, too, the Moors were pre-eminent. Their universities of Cordova, of Cairo and Baghdad, were better equipped than any Christendom could at that time show. At Cairo there were 12,000 students, and many Christians went to study at Cordova and carried back to their northern homes Moorish science and culture. The great philosopher and mathematician Gerbert, who afterwards became Pope as Sylvester II (999-1003), as a young man studied at Cordova.

The Moors made great advances in mathematics and kindred sciences, and their knowledge of medicine was deep and varied, far ahead of the fabulous and superstitious quasi-science of Christian doctors. The name of Avicenna (*d.* 1037) is second to none in the history of medieval medicine, as that of Averroes (*d.* 1198) in scholarship. The latter translated Aristotle, and his commentary on the great philosopher's works became a classic.

Geographical science, too, made great strides under the direction of the Moors. The Arab Edrisi wrote a description of his travels all over the known world, and presented it together with a map and a globe to the Norman King Roger II of Sicily in 1154. At the Sicilian court the Moslems were appreciated at their true value, and poets and philosophers found there a congenial home. Here, too, their beautiful craftsmanship had an opportunity to develop, but elsewhere in Christendom, although Christians might make use of Moslem skill and knowledge, any skirmish might be dignified by the name of a "Crusade," like the conquests of James of Aragon.

* By defeating the Turks at the Battle of Angora in 1402 See Chapter XXXII

XXV

CHARLEMAGNE AND THE HOLY ROMAN EMPIRE

The Coronation of Charlemagne. — Christmas Day, the year 800, is an easy date to remember, and it is one of the most important in medieval history, for on that day Charles the Great (768-814), King of the Franks and conqueror of Saxons and Lombards, was crowned Emperor in St. Peter's at Rome by Pope Leo III (795-816).

The Eastern Empire had declined in power since the days of Justinian (see Chapter XXII), and the name of "Emperor" meant little or nothing to western ears; indeed, the Greeks at this time were ruled by a woman, the infamous Empress Irene (797-802). Either Pope Leo III or Charlemagne himself conceived the idea of reviving the ancient and half-forgotten glories of the Roman Empire and of founding a great Christian world-wide empire on the lines of the *Civitas Dei*, the dream and ideal of St. Augustine. Charlemagne was not, however, blind to the difficulties which would certainly arise, and it is said that he hesitated for a long time before he accepted the Imperial Crown.

Charlemagne had inherited the whole of what is now France, as well as Lotharingia, Swabia and Bavaria. By his conquests of Saxony in the north, and of the Dalmatian coast and of two-thirds of Italy and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

north of Spain, he had extended his boundaries to include most of Christian Europe. His vast dominions included many races, and it was no easy task to govern them, apart from his responsibilities as Emperor.

Charlemagne tried the experiment of sending out "missi dominici" on the same lines as the "itinerant justices" of Henry II (1154-1187) three centuries later in England. It was their business to ensure that justice should be properly administered, to check abuses, to assert the royal power, to hunt down robbers and generally to superintend the morals of both clergy and laity. These "missi" disappeared after the end of the ninth century, and even in Charlemagne's day it seems that bribery was the rule rather than the exception.

Charlemagne stands foremost among all heroes of medieval romance, chiefly because he is the hero of that most popular medieval epic, the *Chanson de Roland*, which tells of the exploits of Charlemagne and his "Paladins"—chief among them the famous Oliver and Roland. "Magnus" was affixed to his name soon after his death; to his contemporaries he was King Charles, who always loved and sought after wisdom.

His biographer, Eginhard, gives an attractive picture of Charlemagne and his court. He represents the Emperor as a fine, strong and attractive-looking man, with a great love of riding, hunting and swimming. He dressed simply, wearing the ordinary Frankish dress of linen shirt and drawers, a fringed tunic and cross-gartered hose, and in winter a jerkin made of otter-skin. He cared nothing for pomp, but was the most hospitable of men, keeping open court and welcoming all foreign visitors. He was an affectionate father and never dined without his family, and when he rode abroad all his sons and daughters accompanied him. Indeed, he loved his daughters so much that "he would give them in marriage to no one. . . . But he kept them all at home, saying that he could not forgo their society."

Charlemagne greatly encouraged learning, and for many years Alcuin of York and many other scholars were to be found at his court. He endowed schools in his dominions, and did much to improve the quality of the church services, for he was a keen musician. In many ways he was enlightened, yet he had his moments of barbarian savagery, which betrayed his Frankish blood. When he conquered the Saxons he ordained that "if any man among the Saxons, being not yet baptized, shall hide himself and refuse to come to baptism, let him die the death." Such was the first of the Holy Roman Emperors,* a commanding figure, typical of his own and the hero of later times, a Christian champion, retaining at heart something of the wild barbarian, yet cultured and enlightened and with great personal charm.

In the year 814 Charlemagne died, and his dominions passed into the far less capable hands of his son, Lewis "the Pious." His sons rebelled against Lewis, and in 843, by the Treaty of Verdun, the Empire was divided into three sections and again later on it was subdivided among Lewis's grandsons. By 888 the Empire was finally divided between the Frankish and German and Italian states, and of Charlemagne's empire scarcely a vestige remained.

The Saxon Emperors, 936-1002.—The next man to revive the Holy Roman Empire was not a Frank but a Saxon, and it was his aim to make the Empire a German perquisite; he was Duke of Saxony first, Emperor afterwards. The foundations of the fortunes of Saxony were laid by Henry "the Fowler" (918-936), but it was his son Otto I, "the Great" (936-973), who crossed the Alps and subdued Italy, conquered the fierce Hungarians at the battle of Lechfeld (955), and in 962 received the Emperor's crown at Rome.

To Otto the Great is due that close connection betweeen the German crown and the shadowy position of Holy Roman Emperor which was to become of such great import; his aim was to define this position, to make it concrete and substantial. Otto combined the feudal character of his kingship with his new office; indeed, he feudalized the Empire, claiming allegiance to himself as Emperor just as to a feudal lord on a gigantic scale. When he died, in 973, he had, at least temporarily, achieved the fusion of the Empire and the German Kingdom.

Otto II (973-983) attempted to carry on his father's work, but met with no striking success. It was his son, the young Otto III (983-1002) who came near to realizing an even more ambitious ideal. He had been brought up south of the Alps (for he had a Greek mother) and his tutor had been the great and cosmopolitan scholar, Gerbert, afterwards Pope Sylvester II (999-1003). (See Chapter XXIV.)

In 996, when Otto III was only fifteen, he declared himself of age and marched into Italy. Where the elder Otto's schemes were splendid, those of the younger were magnificent; his mind was so tuned up to his conception of the Empire as a sacred institution that he took little account of Germany. He was full of schemes for the regeneration of both Empire and Papacy, and he saw in Rome the sacred and eternal city, the centre of the world. He had an

* The title was not formally applied to him, but for the first time to Frederick I (see next page).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

intense enthusiasm for ancient Rome and was obsessed with the glamour of her past; he did not and could not see her as she was, corrupt and treacherous.

Otto's six crowded years as Emperor were full of promise, for he was no mere visionary and could take a strong line of action when occasion demanded. Otto I was a splendid specimen of his age, with practical national ideals; Otto III was an imperialist to the core and a great administrator. He might have accomplished marvels had he lived, but he died of fever near Rome in the year 1002.

The Hohenstaufen Emperors, 1152-1250. —The title of "Holy Roman Emperor" was first officially applied to Frederick of Hohenstaufen (1152-1190), known to posterity as "Barbarossa," from his red beard. Like Otto I and Charlemagne, Frederick made his way to Rome and was there crowned Emperor (1155), but unlike them he went on his own initiative, not at the invitation of the Italians (or a faction of them). The consequence was that he had to fight every step of his way, claiming that the ancient glory of Rome was vested in him and his German followers. "I am the rightful possessor," he said. "Let him who can snatch the club from Hercules."

The Lombard cities, enriched by the new flow of trade brought to them by the Crusades (see Chapter XXX), rejoicing in their newly found power, took up the challenge. From his first visit in 1155 until he finally made peace with the cities in 1183 (the Peace of Constance), Frederick was involved in a continuous and bitter struggle, in which he appeared as the oppressor of freedom, when all he wished for was to be the peacemaker.

In Germany Frederick was more successful. In his own person he united the two rival factions of Germany, for his mother was a "Guelf" and his father a "Ghibelline." He represented the best characteristics of a fundamentally Teutonic character, and it is not surprising that he failed to appreciate the Italian point of view. In Germany he brought peace, but not without a struggle, for the valiant Henry the Lion succeeded in defying his power for many years, during which the Emperor was concerned with Italian affairs.

At length Henry was forced to submit, and in 1181 he was exiled for three years. Now that his most dangerous rival was removed, Frederick ruled Germany with skill and success, developing agriculture and commerce, and granting to the German towns encouragement and freedom, for which the Lombard Communes had been obliged to fight.

The adoption of Frederick Barbarossa as a national hero is singularly fitting. Many far less worthy men have been endued with fabulous posthumous virtues. Frederick was a noble Emperor, he wished to be a generous conqueror, and he was universally acclaimed as the father of his own people.

Frederick's son, Henry VI (1190-1197), was clearly a man of ability, a scholar and a poet, but his tenure of the Imperial office had only fleeting results. It is to his grandson, the second Frederick (1197-1250), known to his age as "Stupor Mundi," that we must turn for the last of the great medieval Emperors. At three years old he became King of Sicily, the inheritance of his Norman mother, and his tempestuous childhood was spent mainly in Palermo, and under the guardianship of the powerful and ambitious Pope Innocent III (1198-1216).

Frederick II is perhaps the most brilliant figure of the Middle Ages, in his versatility and complexity. His incisive, subtle mind spent itself in propounding great schemes and solving the most difficult problems. He had none of the sage and well-balanced qualities of his grandfather, he was passionate, sceptical and cruel. He founded the university at Naples and made friends with the most learned men of his day, whether Europeans, Arabs or Jews. He himself was a poet, and he was equally interested in medicine and law. Artists and scholars of all races flocked to his court, and found in him a patron of the best and highest type.

Frederick II should have been an ideal Emperor, yet the very qualities that made him "Stupor Mundi" led to his downfall. After the death of Innocent III, Frederick was involved in a series of struggles and bitter quarrels with the Papacy, leading to his excommunication at the very moment when he was leading a crusade to Palestine. His contemporaries feared him even more than they admired him, and when he died a legend was circulated that he was not dead but would come again to deliver Germany. This legend was afterwards transferred to his grandfather.

Henry VII and the De Monarchia.—Although Frederick II was the last of the great Emperors, there was one more attempt to revive the ancient glories of the Empire which deserves attention because it inspired one of the greatest of medieval classics, the *De Monarchia* of Dante Alighieri (*d.* 1321). This work is a defence of the principles of world empire, and an argument against the usurpation of power by the Papacy. "It is admitted," Dante wrote, "that the whole human race is ordained for a single end. . . . Therefore there must be one guiding or ruling power. And this is what we mean by monarch or emperor. Thus it appears that for the well-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

being of the world there must be a monarchy or empire."* Dante wrote, too, a letter to the Emperor, begging him to come into Tuscany without delay.

By the end of the twelfth century the factions of "Guelfs and Ghibellines" had spread from Germany to Italy, and their original provenance was forgotten. The Pope was the natural head of the Guelf party, the Emperor of the Ghibellines, and it was by Ghibelline invitation that Henry of Luxemburg made his way to Italy to seek the Imperial crown. He had been elected Emperor in the face of great opposition, and his position in Germany was far from secure.

Henry VII (1308-1313) was "a noble but powerless man, and he set out for Rome with an army of only 5,000 men, chiefly mercenaries. He halted at Milan and at Pavia, where he received the iron crown of Lombardy. Despite his determination to be above all parties, Henry soon found himself involved in local quarrels and was obliged to become increasingly Ghibelline in sentiment.

At last he reached Rome, and in 1312 obtained the coveted crown, but the Romans would not allow him to be crowned in St. Peter's; they barricaded the streets and stood about in defiant groups, ready to fly to arms. Henry VII was crowned in the Lateran, and soon afterwards left Rome and made his way north to lay siege to Florence. It was a half-hearted attempt, and met with no success, and Henry withdrew his troops and again turned southward.

Near Siena he caught fever and died in the year 1313, and with him perished Dante's last hopes of a deliverer. In Paradise Beatrice points out his throne, and refers to him as the regenerator of Italy,† but Dante's confidence was misplaced. Henry of Luxemburg ("the squint-eyed") had no great qualities, nor had he the opportunity or the necessary resources to make a lasting conquest. He was a good and sufficiently able man, and he had fine ideals, but the task that had been too much for Saxon and Hohenstaufen Emperors was far beyond his puny strength. From his death onwards the Empire sinks lower and lower in power and estimation until it finally crumbles away.

XXVI

THE COMING OF THE NORTHMEN

The Norse Adventurers.—Life was a hard and often a cruel business in the north-western corner of Europe. The country was rocky and desolate; only in the narrow valleys could the Norsemen grow their scanty crops, hunting wild animals in the dense woods or spearing salmon in the mountain torrents.

It was no country for weaklings; even in the "season of plenty" there was barely enough corn and meat, and in the "season of want" every man, woman and child knew the meaning of hunger and many perished every year. Yet the Norsemen were a hard and high-spirited race, and since there was little to attract them in their homes, they wandered abroad and sought other richer lands, sometimes landing and founding settlements, more often plundering and pillaging and returning to their northern lands.

The Saxons and Jutes and Angles, who had left their homes on the shores of the North Sea and settled in Britain several centuries earlier, became themselves a prey to the "sea-wolves" from Scandinavia, and fled inland carrying their valuables with them as soon as they caught sight of the long ships of the Northmen. France, Germany* and even Spain suffered from their raids, and in the churches men prayed, "From the fury of the Northmen, good Lord deliver us," just as men were praying in south-eastern Europe to be delivered "from the arrows of the Hungarians." In 855 the Danes first wintered in England, and even the valiant King Alfred (871-901) could do no more than divide his kingdom with the invaders, with whom he concluded the Treaty of Wedmore, 878.

It was not only want which drove the Northmen from their homes, but also an inborn love of adventure, and they rowed their open, undecked ships boldly across the sea, steering only by sun and stars and caring nothing for danger and privation. The ships might carry 100 men, yet they drew so little water that they could be navigated a long way up even shallow rivers, and this added to the terror of the inhabitants, causing them to flee at the first news of approaching ships.

Some of the Northmen followed the coast of Norway as far as the White Sea; others reached the Orkneys and Shetlands and settled there as sheep farmers; others bolder still sailed beyond the Faroës until they sighted "Snowland" (now Iceland) and (*c.* 860) founded there a settlement. It was hard to gain a living in this cold and rocky land, but to the Norsemen difficulties existed only to be overcome.

One of the settlers, in punishment for a crime he had committed, was exiled from Iceland and sailed still farther west till he found a yet more desolate coast. The exile, Eric the Red, named the new country

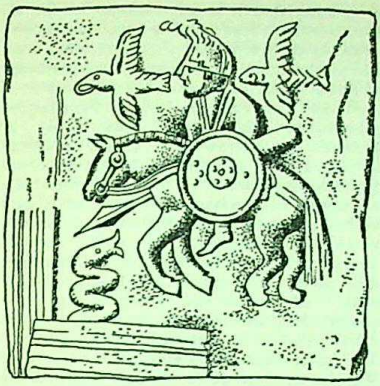
* *The Latin Works of Dante* (Dent), p. 141.

† *Divina Commedia*, Par. xxx, 137.

* That is, the three states of the Verdun partition (see Chapter XXV); many years would pass before France and Germany would become nations

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Mounted Viking as pictured on a bronze plaque in the National Museum, Stockholm

"Greenland" (in the hope that a "good name" would attract future settlers). He reported his discovery to the Icelanders, and a number of emigrants followed him to the colony he had founded on the western coast (985).

The son of Eric the Red, Leif, surnamed "the Lucky," made even more striking discoveries than his father. A report was brought back by some voyager, blown miles out of his course by contrary winds, of a mysterious land lying to the south-west. In the year 995 Leif set out on a voyage to prove the truth or error of this report, and found and named a stretch of coast, well wooded and with a sandy shore, "Markland," and farther to the south a beautiful land of hills and streams where grape-vines and flowers of all kinds grew in profusion. This he named "Vineland the Good," and there can be little doubt that it was part of the North American coast. The wanderings of the Northmen resulted in a discovery which, had it been followed up, must have altered the whole course of world history.

The Normans. — While some of the Norsemen were sailing the western ocean, others had explored the Baltic coasts and penetrated through Lapland into the heart of Russia. Others again had made their homes in northern France, in the province which bears their name—Normandy. Early in the tenth century (911) the French king, realizing that he could not rid himself of the settlers, had accepted homage from their leader, Rollo, and allowed him to style himself Duke of Normandy. Although they had settled down and no longer roamed as pirates, the Normans had lost none of their fire and energy. Now they applied their efforts to making Normandy the best governed state in Europe. The love for adventure remained, too, and younger sons with no lands or ties to keep them at home wandered abroad, seeking their fortunes wherever occasion offered.

By the middle of the eleventh century the Normans had captured part of southern Italy and the whole of Sicily, and they set up there a kingdom which became the admiration of the whole world. At about the same time their brethren in the north achieved the conquest of England, breaking the Saxon power in a single battle (Hastings, 1066). Their kinsfolk, the Danes, had maintained a foothold in England since the ninth century, and had even placed a Dane upon the Saxon throne,* where he reigned most wisely for nearly twenty years, but they never succeeded in making so complete a conquest. The Normans had a peculiar genius for assimilating whatever was best in the civilization of the peoples they conquered, as they had shown in Sicily, where a population of the most heterogeneous kind, with many seemingly conflicting elements, lived in perfect harmony. In England they absorbed the best of the Saxon qualities and habits so rapidly that within a few generations the population was no longer either "Saxon" or "Norman" but English.

XXVII

THE RISE OF MONASTICISM

From the earliest days of Christianity there had always been some Christians who had so deep a sense of God and of the wickedness of the world around them that they felt they must withdraw and make their homes as hermits in caves and desert places. Here they would practise the greatest austerities,† living perhaps on a few dates, or a loaf of bread renewed once a fortnight, inhabiting miserable dens or the deserted lairs of wild beasts.

One hermit lived in a well, and food was lowered down to him by his friends at infrequent intervals. Another washed himself only (and then only partially) on Easter Sunday. Those who could not face the solitary life might join a community of monks, living under severe discipline, and praying and studying the scriptures.

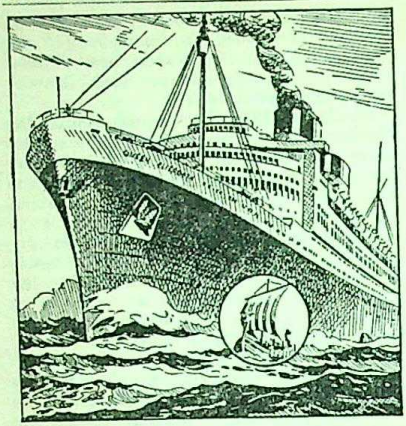
After Europe had become converted to Christianity, the numbers of those "fleeing from the world," far from lessening, seemed to increase, but now they were grieved not so much by the paganism around them as by the abuses they could not but see in the Christian world. Monasticism was an escape from the evils of feudalism, from the

* This was Canute; 1016-1035.

† Like Simeon Stylites on his pillar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Cunard White Star liner Queen Elizabeth *(85,000 tons) and a ship of the type which crossed the Atlantic 900 years ago*

rapacity of the great landowners, from a Church which not only condoned but practised the sin of simony, from the corruptness and immorality of half-civilized rulers and their courts.

Life in the cloister promised to men and women of finer and more sensitive natures escape from contact with the coarseness and ignorance they deplored. It is impossible to understand anything of life in the Middle Ages without taking into account the strength of this impulse to escape from the world into a life of security and calm. For women, too, to enter a convent was often the only alternative to a hateful marriage arranged, perhaps, with complete disregard of all personal feeling.

St. Benedict and his Rule.—Early in the sixth century, Benedict of Nursia (*d.* 543), in the monastery he had founded at Monte Cassino, drew up his celebrated "Rule." This became "the standard code of monastic life for all Western Christendom," and later reformers reverted to this Rule in spirit, though they might adapt its details. Extreme or harsh austerities, scarcely possible for the human frame, found no place in St. Benedict's Rule. "We are . . . now about to institute a school for the service of God," he wrote, "in which we hope nothing harsh nor burdensome will be ordained. But if we proceed in certain things with some little severity, sound reason so advising for the amendment of vices or the preserving of charity, do not for fear of this forthwith flee from the way of salvation, which is always narrow in the beginning."

In this reasonable and tolerant spirit St. Benedict's Rule was drawn up, and it is not surprising that it became the model for all the various Orders; perhaps St. Benedict in drawing it up did more than any other man in his age to carry on the ancient tradition of culture and to ensure its continuance.

When a novice entered a Benedictine monastery, whether he was noble or peasant, he underwent a severe novitiate lasting twelve months in which he could test his vocation. At the end of this time he would be received into the Order, and make his threefold vow of poverty, obedience and chastity. He would work with his hands as well as with his brain, for St. Benedict said that "Idleness is the enemy of the soul." The Abbot had control of the monastery, but was expected to ask and to follow the advice of the whole convent. Perfect obedience was enjoined. ". . . they live not as themselves will, neither do they obey their own desires and pleasures; but following the command and direction of another." The Rule ordered that monks should be dressed in coarse plain garments, and forbade them to have any private possessions. Only the aged and sick were allowed meat, or granted permission to take baths. For them there should be "a kind consideration."

During meals only the voice of the reader was heard; the brethren kept silence and communicated only by signs. Guests were entertained elsewhere, in a guest-house removed from the refectory where the brethren ate. Hospitality was given to all comers, and "broken meats" were distributed to the poor and needy. Services were held in the chapel, beginning with Matins at 2 a.m., and ending with Compline in the evening. The hours after vespers, from three to six o'clock, were generally set aside for study and for writing and illuminating those manuscripts which are the glory of medieval European civilization, and a permanent reminder of the devotion and skill of monastic craftsmen.

Carthusians and Cistercians.—As time passed, some of the monasteries grew slack in their observance of the Rule, and abuses sometimes crept in. The first important reformation took place with the foundation of Cluny, in Burgundy, in the year 910.

In about 1084 another monastery was founded at Chartreux. The Carthusian monks led a strict life of toil and prayer, and abjured all the pleasures of the world. A third order of reformed Benedictines was founded from Citeaux, in France, and daughter monasteries sprang up all over Europe, particularly in England, where the Cistercian monks did much good work for the country in reclaiming barren wasteland, and in sheep farming.

The Cistercians sought out the most lonely places in which to build their

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

glorious churches and monasteries; they had such a horror of riches that they would not even allow their priests to wear embroidered vestments. The most famous of Cistercians was St. Bernard (*d.* 1153), who founded Clairvaux. St. Bernard shook all Christendom with his eloquence; he roused Europe to a Crusade, he reproved a king, deposed an anti-Pope and denounced heretics. He is one of the most typical and interesting figures in medieval history, and shows in his own person the ideals of monasticism.

XXVIII

FEUDALISM

The Nature of Feudalism.—The essence of the idea of feudalism is that all land originally belongs to the king, and his tenants hold it from him on condition of performing certain services. The tenants-in-chief, holding directly from the king, grant lands to lesser men in their turn, making the grant conditional upon services rendered. In return, the lord would protect his tenants against aggression, just as the king protected him. The services demanded of tenants-in-chief would generally be military, those they exacted from their tenants would usually be manual labour on their lord's estate. The service or the labour demanded was proportionate to the holding.

This is a broad description of the working of a very complex machine. The system was the fruit of old ideas, both Roman and barbarian. Each tenant would take an oath of homage to his lord, promising him the utmost loyalty in whatsoever he should undertake. As abbots and bishops were among the most important tenants, it will be seen that the system held the seeds of many quarrels between Church and State.

At its best, feudalism stood for the protection of the weak in an age when only too often might was right. It inspired, too, a mutual loyalty between the lord and his man, between the barons and their king. The evils of the system were, however, much more apparent than its merits. The lords held their own judicial courts and meted out what justice they chose; on their own estates they had almost absolute power. Even the "missi" sent out by Charlemagne (see Chapter XXV) could do little to combat local oppression. Many of the barons made private war between themselves and built themselves strong castles (using the free labour of their wretched tenants), from which they could defy the king's authority. A Provençal baron of the twelfth century sang:

"I, Sirs, am for war,
Peace giveth me pain,
No other creed will hold me again."*

* *A History of Europe.* I. L. Plunket, p. 123.

There must have been many who agreed with him, to judge by the fierceness and prevalence of local fighting all over Europe.

Even in England, where feudalism was firmly checked by such strong kings as William I (1066-1087) and Henry II (1159-1189), as soon as a weakling sat upon the throne, its worst elements became at once apparent. Under the mild King Stephen (1135-1154) "every rich man built his castle . . . and when the castles were made they filled them with devils and evil men. Then took they those whom they supposed to have any goods, both by night and by day, labouring men and women, and threw them into prison for their gold and silver, and inflicted on them unutterable tortures . . . nor even did heathen men worse than they."*

The Investiture Controversy. — It has already been pointed out that the bishops and abbots were great landowners, and there is no reason to suppose that they were in any marked degree superior to lay landowners. They may not have tortured their villeins, but they could be hard taskmasters. They did not themselves ride to battle, but they had to supply arms and men for their overlord, and from the villeins' point of view there can have been little difference between a lay and an ecclesiastical estate.

It was the dual character of the bishops which caused the friction ultimately leading to the investiture controversy of the eleventh century. Their lands they held from the king, their holy office from God. To whom should they acknowledge allegiance (symbolized by their investiture with the ring and crozier of their office)—to God's representative on earth or to their king?

This question arose in its most acute form in the contest between Empire and Papacy. In the days of Charlemagne, and even at the time of Otto the Great, the Pope had been more or less dependent upon the Emperor, but by the second half of the eleventh century the position was rapidly changing. The Papacy had sunk to a very low level during the previous fifty years and vicious and unworthy adventurers had occupied the Holy See. It was the Salian Emperor, Henry III (1039-1056), who initiated the movement for reform by deposing (at the Synod of Sutri in 1046) the Pope and two anti-Popes, and nominating a suitable candidate, who was his own cousin, as Pope Leo IX (1048-1059).

The reform of the Church was thus begun by Leo IX, but it was carried much further by Hildebrand, who became Pope Gregory VII (1073-1085). Hildebrand had been Archdeacon of Rome, and so had acquired experience which stood him in good stead.

* *The Anglo-Saxon Chronicle.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In Hildebrand the Papacy found a worthy champion; indeed, his idealistic conception of his office soared far higher than the eye of the average man could see. He was determined, first of all, to root out the two deep-seated abuses which were sapping the strength of the Church—simony, and the marriage of the clergy. He hoped to convert the savage Turks, who had just won the Battle of Manzikert (1071) and begun to ravage Asia Minor (see Chapter XXIV), but he was obliged to lay aside this dream for more immediate tasks.

The idea of reform was in the air; it had been brought into being by the foundation of Cluny (see Chapter XXVII). Hildebrand raised the Papacy to the highest point it has ever reached, and put his new-found power to the proof in 1075, when he issued his famous decree against lay investiture. This decree seemed to most rulers of the day to be the height of arrogance on the part of Hildebrand, and they attempted to disregard it. William the Conqueror continued to invest his bishops, but as he showed great care and discrimination in their selection, and as England was so far from the Eternal City, Hildebrand was wise enough to overlook his defiance.

The real test came when the Emperor Henry IV (1056-1106), after disregarding the Pope's decree and returning an insolent answer to his remonstrance, called a council which he instructed to declare Hildebrand deposed from his office. The Pope replied with a sentence of excommunication. This was the opportunity for which Henry's disaffected vassals had been waiting, and they used it to rebel against his authority. Moreover, Hildebrand announced that he would come in person to Germany, and this thoroughly alarmed Henry IV. He hurriedly made his way across the Alps, although it was mid-winter and terribly cold, and came to Hildebrand's castle at Canossa. Here the Pope kept him waiting, standing barefoot in the courtyard, clad in pilgrim's garb, for three whole days. At last Hildebrand received the Emperor's abject submission, and he returned to Germany free from the ban of excommunication.

The Emperor's humiliation at Canossa occurred in 1077, and this year marks the peak of Hildebrand's power. Henry's penitence was only skin-deep, and soon he was plotting a revenge. Imperial troops surrounded Hildebrand in the Castle of St. Angelo, in Rome, and the Pope was rescued only by the intervention of the Norman adventurer Robert Guiscard, and carried off by him to safety which was little better than captivity. In his bitterness of heart, Hildebrand exclaimed, "I have loved justice and hated iniquity: therefore I die in exile." Yet finally he triumphed, for his successors carried on the struggle until at last a compromise was reached (the Concordat of Worms, 1122), by which rulers gave up the right of investing prelates with ring and crozier but received homage from them for their lands.

So ended this bitter struggle between Church and State.* It was by no means the last which would occur, but it was one which concerned all Christendom. Most European countries had their own private quarrels between laymen and ecclesiastics; in England, for instance, the dispute about jurisdiction over criminous clerks, which ended in the murder of Archbishop Becket (1170) and the penance of King Henry II. But the investiture controversy held the seeds of many a future conflict, and the submission at Canossa made a profound impression upon all Europe.

XXIX

HERESY AND SCHISM IN MEDIEVAL EUROPE

The Nature of Scholasticism.—In the Middle Ages all learning was strongly tinctured with theology. Philosophy meant Christian philosophy, and even mathematics and geographical science were coloured with Church teaching. The writings of the Early Fathers, particularly St. Jerome and St. Augustine, were studied to the exclusion of most other books, and medieval study was centred on exposition and commentary rather than on original and independent thought. The Church was suspicious of and ready to condemn any departure from the orthodox lines of thought.

This suggests a narrowness of scope and outlook which is not altogether borne out by the facts. It is true that scholasticism did tend to direct scholarship into certain well-defined channels, but it also provided excellent mental discipline and gave scope for profound knowledge and accuracy as well as for subtle distinctions which might deteriorate into mere verbal quibbles. Aristotle was studied with the greatest care and theologians were at great pains in trying to reconcile his teaching with Christian doctrine.

There were, nevertheless, daring and original thinkers among the schoolmen. Greatest of all was St. Thomas Aquinas (*d.* 1274), whose *Summa Theologica* is the epitome of scholastic teaching. At the other extreme is Marsilio of Padua, who in 1326 issued his *Defensor Pacis*, a challenge to Papal authority. Between these two poles are many famous names: among them, Anselm, Archbishop of Canterbury (*d.* 1111);

*In England Henry I and Archbishop Anselm had come to a similar agreement some fifteen years earlier.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Peter Lombard (*d.* 1160), of "The Sentences" fame; Roger Bacon, the "Doctor Mirabilis," greatest of medieval scientists (*d.* 1294); and Albertus Magnus (*d.* 1280), the Aristotelian scholar.

Heresy and Heretics.—Those who were daring and independent enough to question the dogmas of scholasticism were liable to be classed as heretics and might incur the displeasure of the Church, and even persecution and excommunication. One of the most brilliant of Paris theologians was Peter Abelard (*d.* 1142), who applied the test of reason to beliefs taught hitherto as matters of faith. Soon he came into conflict with the Church, represented by St. Bernard* of Clairvaux (*d.* 1153), and at last Abelard was driven into retirement and his works were publicly burned.

The Church has suffered from time to time from various heretical movements and schisms. As early as 325 St. Athanasius (*d.* 373) had condemned the doctrine of Arianism, and it was not until the sixth century that Arianism was successfully checked. In the Middle Ages the most serious outbreak of heresy occurred in Languedoc and Provence, where the Counts of Toulouse held their gay and highly civilized court, thronged with troubadours and artists. In the thirteenth century the Counts of Toulouse were almost independent rulers, and cared little for the authority of their overlord, the French king, and less for the spiritual authority of the Pope. Their people scorned the priests and derided the Catholic Faith; they formed various heretical sects of their own, the most important being the Albigenses and Waldenses (or "Poor Men of Lyons"). The Waldenses wandered over the country preaching Apostolic poverty and protesting the superiority of the authority of the Bible over Church doctrine.

The Pope, suspicious of their teachings, condemned the Albigenses and Waldenses and exhorted them to mend their ways. He was Innocent III (1198-1216), one of the greatest of medieval pontiffs, and he determined to stamp out this heresy. First he tried persuasion, and sent the Spaniard St. Dominic (*d.* 1221) to hold a mission in Languedoc, but, although St. Dominic was received with respect, he could not win the heretics back to orthodoxy.

In 1208 the Count of Toulouse was excommunicated and Innocent III declared him deposed and preached a crusade against him and his followers. For twenty years the battle raged, and much blood was shed, for the crusade was under the direction of a cruel and unscrupulous leader, Count Simon de Montfort, the father of the English earl of that name. Innocent III set up the "terrible and efficient" machinery of the Inquisition for the discovery of heresy, empowering the Inquisitors to convert the heretics by fire and torture. Although St. Dominic himself was earnest and gentle in his dealings with the people of Languedoc, many members of his Order (see Chapter XXXI) became Inquisitors and conducted their inquiries with more zeal than humanity. The Inquisition was at first controlled by the local bishops, but during the pontificate of Gregory IX (1227-1241) control was transferred to the Papal See.

The Albigensian Crusade was a miserable business, and brought neither credit nor profit to anyone except the wily King Philip Augustus of France (1180-1223), who incited his nobles to join the crusade while standing aloof from it himself. His patience and foresight were rewarded, and he was able to enrich the royal domain by the addition of many great fiefs.

The Babylonish Captivity, 1309-1378.—The period known as the "Babylonish Captivity" is one of the darkest in the history of the medieval Church. During this time, a succession of Popes dwelt on French soil and under French influence. The crisis was precipitated by the violence and arrogance of Pope Boniface VIII (1294-1303), who asserted papal claims of an extravagance which might have made Hildebrand hesitate and would certainly have been modified even by Innocent III. His Papal Bull, "Clericis Laicos," forbidding the clergy to pay taxes to any lay ruler, had goaded the English King Edward I (1272-1307) into open revolt, and Philip IV of France (1285-1314) retaliated even more violently. Boniface excommunicated him, and Philip IV sent an army under one of his courtiers, who captured the fiery Pope (he was eighty-six years old) at Anagni and subjected him to insult and defiance. Soon afterwards Boniface died, and Philip induced the Cardinals to elect a creature of his own, the Archbishop of Bordeaux, as his successor.

Henceforward the Popes lived at Avignon, and not one of them set foot in Italy until Pope Gregory XI returned to reside in Rome in 1376, at the prayer of St. Catherine of Siena. Worse still was to befall, for in 1378, when Gregory XI died, two rival Popes were elected, one at Avignon, the other at Rome. The schism was perpetuated* by further elections when these Popes died, and Christendom was shocked, and Papal prestige brought to the ground, by the spectacle of rival Popes fulminating against one another, excommunicating one another, and bringing their holy office into disrepute. This is the darkest episode of a dark chapter.

* See Chapter XXVII.

* It was at last brought to an end at the Council of Constance in 1414.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

XXX

THE CRUSADERS

Pilgrims to Jerusalem.—From the days of the Emperor Constantine, Christian pilgrims of all nations had flocked to Palestine to visit the holy places in and about Jerusalem. Constantine's mother, Helena, had found what was believed to be the True Cross on which Christ was crucified, and her discovery made a profound impression upon the whole Christian world. By the year 333 the first "Itinerary from Bordeaux to Jerusalem" made its appearance, and at the end of the fourth century St. Jerome could write of Jerusalem, "From all the world people are flocking here."

Until the middle of the eleventh century the stream of pilgrims showed no signs of slackening. The Holy Places were in Moslem hands, and this seemed to many Christians a terrible thing, but worse was to come, for in the year 1070 the Seljuk Turks captured Jerusalem, and Christians were no longer admitted to the Holy Places. The Moslems had allowed the Christians privileges, and control of the Christian churches, and had contented themselves with exacting dues and selling dubious relics to the pilgrims, but the Seljuks would not even tolerate them.

Christendom was profoundly shocked at the news, and preachers such as Peter the Hermit tried to stir men to make the effort to recover Jerusalem. The appeal met with a great response, not only from those Christians who felt it an insult and shame that the infidels should occupy those Holy Places where Christ had lived and taught, but also from those in search of adventure.

The First Crusade.—In the year 1095 Pope Urban II (1088-1099) called a council at Clermont, and urged with all the authority at his command that every man should lay aside his worldly ambitions and "take the Cross" and join the Crusading army, promising indulgences to all those who should respond.

Men from every country took the Cross, and what the Crusading host lacked in organization, experience and equipment, it more than made up for by its sincere enthusiasm. Several false starts were made, but at last the main body of Crusaders assembled near Byzantium, ready to launch the attack.

After a nine months' siege, Antioch fell in the summer of 1098, and the following year Jerusalem also fell to the Crusaders, who celebrated their capture by a bloody massacre of the inhabitants. Antioch had already been made a principality under a Norman ruler; now the new Crusading "Kingdom of Jerusalem" was formed and the valiant and saintly Godfrey of Bouillon chosen as its first sovereign. Godfrey, however, would not wear an earthly crown where Christ had worn a crown of thorns, and ruled only as "Baron of the Holy Sepulchre." The following year his brother Baldwin I took the title of king and reigned from 1100-1118.

The Second Crusade (1147-1149) failed.

The Third Crusade, 1188-1192. — For nearly ninety years Jerusalem remained a Christian province, but in 1187 the news was brought to Europe by a black-sailed ship that the city had fallen to the Mohammedans under their brilliant leader Saladin (*d.* 1193). A further appeal was made to Christendom, and again a great response was made and a great host collected. Yet this, the Third Crusade, lacked something of the spontaneous enthusiasm and ardour which had brought the early Crusaders success. Perhaps the Crusading host included too many famous names—the kings of France and England, the Duke of Austria, the Count of Flanders and the Emperor Frederick Barbarossa, to name the most distinguished. The Emperor perished in Cilicia, and quarrels broke out among the leaders, who showed resentment of the high-handed actions of Richard I of England (1189-1199), while they paid unwilling respect to his military genius.

Despite the sternest efforts and several brilliant victories, the Crusaders failed to recapture Jerusalem. Richard of England held his shield before his eyes when he came in sight of the Holy City; since he could not capture it, he would not allow his eyes to behold it. Richard made terms with Saladin; the two great leaders had the deepest mutual respect and vied with each other in chivalry and courtesy, Saladin sending Richard a present of fruit and snow when he lay ill in his tent. The negotiations lasted for a whole year and resulted in a much better understanding between Mohammedans and Christians, though the Latin kingdom was reduced to a narrow strip of coast and the Crusaders were obliged to admit failure.

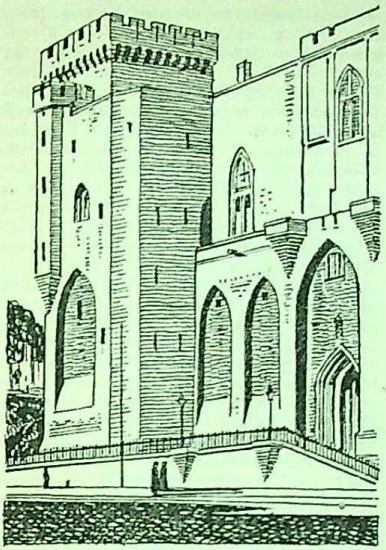
The failure of the Fourth Crusade, 1202-1204.—Already the first and purest Crusading impulse had spent itself, and petty quarrelling and jealousy had taken the place of whole-hearted devotion to the cause of delivering the Holy City from infidel hands.

The Fourth Crusade showed the movement at its worst. It was directed not against the Mohammedan conquerors of Palestine, but against the usurpers of power in the Byzantine Empire.

Originally it was intended for an attack from the sea upon Egypt as a preliminary to the Syrian campaign, but owing partly to the Venetians' insistence upon full pay-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Palace of Popes at Avignon

ment for their transport (the Venetians had built special transport ships and agreed upon a price which the Crusaders failed to pay), and partly to intrigues among the leaders, the Crusading host sailed to Byzantium instead. The city was captured after a short struggle, and then came months of looting and pillage and carnage, when the Crusaders behaved more like savage and rapacious animals than as soldiers of the Cross. A Latin empire was founded under Baldwin, Count of Flanders, but this lasted only until 1261. The share of Venice in this crusade is symbolized by the four famous bronze horses which still stand outside San Marco—part of the spoil which the Venetians brought back from Justinian's palace.

The Crusades of St. Louis.—After the sordid incompetence of the Fourth Crusade, and the quarrels and intrigues which followed it, it is something of a surprise to find a leader who can be compared only with Godfrey of Bouillon in his integrity and chivalrous behaviour in the most trying of circumstances. This was Louis IX, King of France from 1226 till his death at Tunis in 1270. His biographer, Joinville, says of him that "no layman in our time lived so holily all his days," and that he "so loved truth . . . he would never consent to lie to the Saracens as to any covenant that he had made with them."

At first, St. Louis was successful, and captured Damietta (in Egypt) without striking a blow, but then misfortune overtook his host, and he and his whole army suffered capture (1249) and had to pay an enormous ransom. For a while St. Louis stayed in Palestine, but could do little. In 1270 he made a further effort and landed in North Africa in an attempt to make an alliance with the Bey of Tunis, but fell ill and died. His last words were "Jerusalem, Jerusalem."

After this, a few spasmodic efforts were made, but all hope of a serious expedition died with St. Louis. In 1291, with the fall of Acre, the Latin kingdom of Jerusalem came to an inglorious end.

The Results of the Crusades.—It is very difficult for posterity to appraise with any exactness the results of the Crusades. Even to the men of the twelfth and thirteenth centuries, there were many different interpretations of the Crusading impulse. Some joined the movement for righteousness' sake, because they longed to extend God's kingdom upon earth; others hoped thereby to purchase salvation for their own souls. Some were penitents seeking to expiate mortal sin, some were high-spirited young men in search of adventure. Others again thought they discerned opportunities for seizing loot and treasure, or for opening up trade communications which might bring them profit.

It has been pointed out* that the Crusades ended, "not in the occupation of the East by the Christian West, but in the conquest of the West by the Mohammedan East." So far, the movement was a failure, but when we turn to the history of Western civilization, and the development of commerce, we are on firmer ground. A very great impetus was given to trade, and new centres opened up in Syria and the Levant. Indirectly, the movement was responsible for the explorations through Asia undertaken by Carpini and the Polos and their successors (see Chapter XXXIV). Genoa certainly owed her power and influence to the Crusades, and up to the War of Chioggia (1378-81) she was the rival even of Venice.

The art of war owed much to the experience gained by Crusaders. New ideas of fortification, engineering feats, the concoction and use of "Greek fire"—all these the Crusaders learned from their Mohammedan enemies. It is thought, too, that the general use of a "coat of arms" dates from this time, when a linen tunic might be worn over armour as some protection from the sun's rays, bearing some device to make recognition easy.

In France and England, during the twelfth century, taxes were instituted for

* Barker: *The Crusades* (1923), p. 97.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

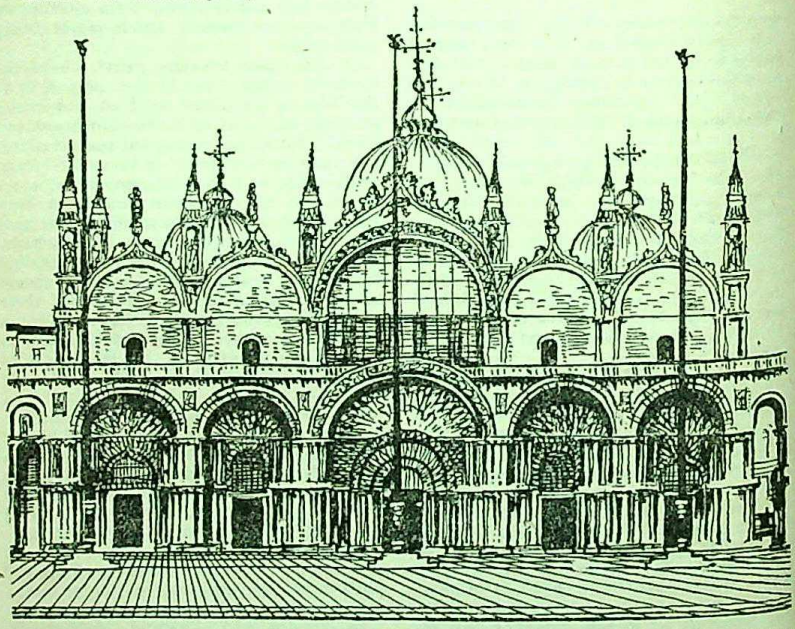
the Crusades—if a man could not or would not take the Cross, he must pay a tax to help the cause. The first tax had been imposed by Louis VII (1137-1180) in 1147, and imitated by Henry II of England (1154-1187) in 1166, and again in the celebrated "Saladin Tithe" of 1188. This is sometimes reckoned as the beginning of the modern system of taxation.

The Crusades stimulated an interest in geography, in travel and in the study of Eastern languages, the study so strongly urged by the great missionary and scholar, Raymond Lull (*d.* 1315). They offered, too, a new field for literature, for poems and "chansons." In lesser, yet in some ways equally important details, it should be remembered that they "familiarized Europe with new plants, new fruits, new manufactures, new colours and new fashions in dress. Sugar and maize; lemons and melons; cotton, muslin and damask; lilac and purple (azure and gules are words derived from the Arabic); the use of powder and of glass mirrors, and even of the rosary itself—these things came to medieval Europe from the East and as a result of the Crusades."* It is strange, too, to think that among various Arabic words adopted into our language, one which is constantly upon our lips today—the word "tariff"—is yet another witness to the influence of the Crusades.

The Military Orders.—When the main body of the Crusading host left Palestine after the foundation of the Latin Kingdom of Jerusalem, it was necessary to leave behind a regular force to defend the new state, and also to protect pilgrims visiting the Holy Places. To meet this need, two military Orders were founded, on the lines of the monastic orders in Europe. These were the Order of the Knights of the Hospital of St. John, which had been founded in 1048 for the care and protection of pilgrims, and that of the Order of the Temple, founded in 1118.

Of these two Orders, that of the "Templars" became the larger and the more important; soon its membership increased from the original nine founders to a huge number. They began to acquire lands and riches in most countries of Europe, to work their estates, and to build handsome churches, generally in imitation of the Church of the Holy Sepulchre at Jerusalem. The round Temple Church in London, destroyed in an air-raid in 1941, was an outstanding example. As the Knights Templars

* Barker: *The Crusades*, p. 104.



Basilica of St. Mark, Venice. Commenced in the eleventh century, it combines Italian and Byzantine ideas of architecture. It is the third church on this site

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and the Knights of St. John developed wider interests, and as their task in preserving the Holy Land became increasingly difficult (and, finally, impossible), the knights began to lose sight of the original intentions of their founders and to acquire Oriental habits which were not in accordance with their ideals.

The Templars had taken the threefold monastic vow of chastity, obedience and poverty, but as time passed occasional abuses crept into the practice of the Order, enough to provide a pretext for their suppression. In France Philip IV (1285-1314), moved more by a desire for the Templars' wealth than by any genuine belief in the corruptness of the Order, ordered their examination in 1308. The trial lasted for years and was conducted with the utmost unfairness and cruelty, torture being used to extract alleged "confessions." Many knights were burned at the stake, and last of all the Grand Master met the same fate in 1314, protesting the innocence of the Order with his dying breath.

The wealth of the Templars was supposed to be passed on to the Knights Hospitallers, who justified their existence by defending the island of Rhodes as a Christian outpost, but there is reason to believe that most of the treasure eventually found a home in the royal treasury.

A third Order, the Teutonic Knights, had been founded in 1191 in imitation of the Knights of St. John. This Order was limited to men of German race, and in the year 1229 the Teutonic Knights transferred their activities to Prussia, where they allied with a similar Order, the Knights of the Sword, to overcome and convert the heathen Prussians; an enterprise in which they were strikingly successful.

XXXI

THE COMING OF THE FRIARS

St. Francis of Assisi.—Few men have had a more profound and enduring influence, simply by force of their own personality, than Francis, the son of Pietro Bernardone, a merchant of Assisi. As a boy he was light-hearted and gay, a popular member of society in the little town. Suddenly there came a call, and he abandoned his pleasure-seeking life and began to spend his time among the poor outcasts, wrecks of humanity such as lepers. It was generally assumed that a loathsome disease must be sent as punishment for sin; and this partly accounts for the callous attitude to sufferers which was general in the Middle Ages. But Francis gave all he had to help beggars and lepers, to the great annoyance of his parents and friends.

Finally he gave up all his possessions, even the clothes he wore, and putting on a coarse robe of brown* wool he renounced the world and vowed he would wed none other than "My Lady Poverty." Soon others joined Francis, like him disgusted at the heartlessness and faithlessness of the world, and at last he decided to found an Order of Friars who should preach simply to the people and nurse the sick and comfort the wretched. Pope Innocent III (1198-1216) encouraged Francis to carry on his work, but the Franciscan Order did not receive formal sanction until 1223.

Francis retained all his former joy in life, despite the squalor and poverty in which he chose to live. Nor did he confine his help and sympathy to human beings; many stories are told of his kindness to animals and birds, how he would set free caged birds, and how he persuaded the savage wolf of Agobio to give up his marauding ways. When St. Francis died, in 1226, his Order was well known and his followers were to be seen all over Europe, for they filled a place in medieval society and supplied a quality that had long been lacking. The monks led holy lives, many of them, in the seclusion of their monasteries, but they did not go out into the world to grapple with unhappiness and disease at first hand, nor did they keep in touch with the world, for they lived in a world apart, each monastery a little world to itself.

St. Dominic and His Order. — Meanwhile, St. Dominic (see Chapter XXIX) had founded a similar Order of "Preaching Friars," who vowed themselves to poverty as the Franciscans had done, and like them they begged their bread as they went. The Popes recognized the sincerity of the Friars and saw in them a new weapon for opposing worldliness and corruption.

Soon the Friars made their way to the universities, and here their influence was great. The two Orders preserved their individuality, reflecting the spirit of their founders, for St. Dominic was known as "the Hammer of the Heretics," while St. Francis was "the Father of the Poor," and yet, as Dante says in the *Divine Comedy* (where he places them side by side in Heaven), "their deeds were to one end."

The Dominicans aimed their mission at the more educated classes, the Franciscans appealing to the minds of the poor while tending their bodies. The former were sometimes called—with a typically medieval pun—"Domini canes," "the Lord's Watch-dogs," to protect the Lord's flock against ravening heretic wolves. St. Thomas Aquinas was the most famous of

* "Brown" by our standards, but Francis and his followers were known as the "Grey" Friars. The Dominicans wore black habits and were called the "Black" Friars.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Dominicans, as Roger Bacon was of Franciscans. Both Orders played an important part in affairs, sometimes as emissaries of the Pope, or as negotiators and advisers in political crises. In this connection they travelled some distance from the original intention of their founders, and the simple piety and mysticism of the first members spent itself, until dissensions arose within the Orders themselves, and the seeds of corruption were sown. But in the early thirteenth century both black and brown habits* were welcomed among all those who were poor or sick, or in any way distressed.

XXXII

THE MONGOL EMPIRE

The Conquests of Jenghiz Khan.—Early in the thirteenth century Europe was alarmed by the appearance of a strange nomad race advancing from the East. These nomads were the Mongols, or Tartars, a flat-faced, yellow-skinned people, living on meat and a drink made from fermented mare's milk. They roamed the grassy plains, driving their herds before them, and swept across the open spaces of Asia like a prairie fire.

The great Moslem Empire (see Chapter XXIV) had lost its first strength, and had broken up into a number of separate states divided from one another by mutual jealousies. The Caliph of Baghdad was on unfriendly terms with the successors of Saladin in Syria, the Seljuk Turks in Asia Minor had little in common with those dwelling between the Ganges and the Tigris; the Chinese Empire was divided between the native Sung dynasty in the south and the recently established Chin (Golden) Tartar kingdom in the north. It was against the Chin that the Mongol leader, Jenghiz Khan (1206-1227), opened his attack, and in 1214 he seized their capital, Peking. Next, his horsemen swept through Persia and Samarkand, the capital of the Turkish Kharismian Empire.

No power seemed able to withstand them, and when Jenghiz Khan died in 1227 his dominions extended across Asia and into Europe; from the Pacific Ocean to the Dnieper in Russia, from the Yellow River almost to the banks of the Danube. Under Ogdai Khan, the son of Jenghiz Khan, the new empire was extended even further, and when the Mongols exterminated a combined force of Poles and Germans in 1241 at the Battle of Liegnitz in Silesia, it seemed that they held all Europe at their mercy. Yet they advanced no farther. Partly because wooded and mountainous country was unsuited to their herds, and partly owing to the dissensions which followed the death of Ogdai Khan, the Mongols turned back from Europe and retreated to the East whence they had come.

Kublai Khan in China.—When the Great Kublai Khan succeeded to the empire in 1260, he found that his authority covered only China and Mongolia, while his brother reigned in Persia, Syria and Asia Minor, and Russia and Turkestan were under separate rulers. Kublai made Peking the capital of his empire, finally overthrew the Sung, and founded a dynasty which reigned there until 1368. The traveller Marco Polo has left a graphic description of the beauties and marvels of Kublai's kingdom,* and tells us of Kublai's efforts to learn something of the Christian religion.

Kublai asked for a hundred learned teachers, but unfortunately, the Christian Church could not rise to the occasion. When Kublai's request was tendered, the Papacy was suffering from a schism, and when a Pope was at last appointed, and sent two Dominican Friars (in place of the hundred invited) they proved such timid travellers that they turned back soon after they had started. In this way Christendom lost perhaps the greatest opportunity ever offered. When at last the Church was ready to accede to Kublai's request, it was centuries too late, and the vast Mongol Empire had embraced the doctrines of either Buddhism or Islam.

Tamerlane the Great, 1370-1405.—Kublai Khan died in 1294, and after his death his successors ruled till the year 1368, when a rebellion resulted in the setting up of the artistic Ming dynasty, while in South Russia the Mongols resumed their nomadic habits and under their leader, the Khan of the Golden Horde, exacted tribute from the Russian cities. At the end of the fourteenth century there arose a leader in Western Turkestan who aimed at restoring the Empire of Jenghiz Khan. This was Tamerlane, a man of the utmost ferocity, who ravaged India, and by his death in 1405 had gained himself a reputation for the most violent terrorism. After he had stormed Ispahan it is said that he built a pyramid of 70,000 skulls from the unfortunate inhabitants.

For all his savagery, Tamerlane could not revive the Empire of Jenghiz Khan, but he did provide a severe set-back to the power of the Ottoman Turks who, driven from their homes by the armies of Jenghiz Khan, had settled in Asia Minor and were threatening Eastern Europe with destruc-

* A third Order, of "White Friars," or Carmelites was afterwards founded.

* See Chapter XXXIV. It was Marco Polo's description of the Khan's summer palace at Shandu which inspired Coleridge's famous lines.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tion. By the Battle of Angora in 1402 Tamerlane temporarily broke their power, and delayed the Turkish capture of Constantinople for perhaps fifty years. Another people driven from their home by Mongol conquests were the Gipsies (or Egyptians, as they were at first called from their supposed native land), and they still retain their nomadic habits and language derived from the East, as a reminder of the time when the Mongols swept them from their homes in Asia.

XXXIII

EUROPE IN THE MIDDLE AGES. THE GROWTH OF NATIONALITY

ENGLAND AND FRANCE.—In the early Middle Ages it is difficult to estimate frontiers and to draw distinctions between nations, for nationality was a plant of slow growth and easily choked by the weeds of feudalism. England was the first of European countries to develop its own nationality, chiefly by reason of its self-contained geographical position.

The Making of England.—When the Roman hosts were withdrawn, the Britons, unused to defending themselves, fell an easy prey to the invaders, among whom the Saxons predominated. As these settlers, too, grew careless of defence, they in their turn fell a prey to the savage Norsemen, and paid them tribute to depart, until Alfred (871-901), the best and strongest of Saxon kings, showed that it was possible to beat off the invaders.

From his time until the Norman Conquest in 1066, the Saxons suffered continually from Danish marauders, but when William I, "the Conqueror" (1066-1087), secured the English crown after the Battle of Hastings (1066), he showed that he intended to rule as an absolute king. He made his vassals swear allegiance to him at Salisbury, and he caused a minute survey to be made of all the lands of his realm. This was known as "Domesday Book," and "There was not a single hide nor a rood of land, nor . . an ox, or a cow, or a pig . . . that was not set down in the account."*

The strongest kings continued the Conqueror's work, and kept in check the worst evils of feudalism, but in 1199 there came to the throne a man as worthless as he was weak (John, 1199-1216), and against him the English barons rebelled and forced him to agree to "Magna Carta" in 1215, by which he promised to respect their liberties. This was a great step forward, and the same century (1265) the foundations of Parliamentary government were laid by Simon de Montfort (*d.* 1268), and built upon by King Edward I (1272-1307) when he summoned the Model Parliament of 1298. England had already begun to be a nation, and to develop its most salient characteristic—a love of justice and order, which was later to express itself in the ideal of parliamentary government.

The Hundred Years War.—When the Norman nobles followed William to England in 1066, they did not give up the estates they held in Normandy, but continued to do homage for them to the French king, so that they acknowledged two different feudal lords. This was an unsatisfactory position, and led to great friction, for the English king was himself the French king's vassal. Henry II of England (1154-1189), by a fortunate marriage, actually held more lands in France than the French king, and so, although his feudal inferior, was much more powerful.

Under the successors of Henry II, the English possessions in France crumbled away, first when Philip Augustus of France (1180-1223) won the Battle of Bouvines in 1214, and many of the descendants of the Norman conquerors of England finally lost their French lands. This battle is one of the most important in French history, but it marks only the beginning of the struggle which is seen at its height in the "Hundred Years War" which broke out in the next century.

The ambitions of Edward III (1327-1377) led him to claim the French crown to which he had but a shadowy right, and his aggression led to a series of campaigns which at first proved disastrous to the French. The English won the Battles of Crécy (1346) and Poitiers (1356) against heavy odds, and by the Treaty of Brétigny (1360) secured the whole of Guienne and Gascony. What the English had gained, however, they could not keep, and despite further campaigns their dominions shrank away to no more than a few coast towns.

One result of this war was the strengthening of the bond between England and Flanders, and consequent friction between Flanders and the French Crown. The Flemings were dependent upon the English supplies of wool for the cloth-weaving which was their main industry, and when English supplies ceased, the Flemings starved.

"Flanders of needes must with us have peace.

Or else she is destroyéd without lees,"

as an English poet wrote in the following century.

Again the struggle broke out when Henry V of England (1413-1422) sought glory and a crown in the Agincourt campaign of 1415. This was the last success the English won.

* From the *Anglo-Saxon Chronicle*. The Domesday survey was made in 1085

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and when Joan of Arc, "the Maid of Orleans," called upon her countrymen to deliver their land, she awoke response in many hearts. The English thought she was a witch, and burned her at the stake (in 1431), but her work was done, and the English were driven out of stronghold after stronghold until only Calais remained to them of all their French possessions.* France, too, had become a nation.

GERMANY AND THE EMPIRE.—Throughout the Middle Ages Germany was no more than a collection of territories under miscellaneous rulers, held together by no ties of race or loyalty or culture or economic interest, under the very shadowy Holy Roman Empire which was little more than an abstraction. The Emperor was elected from among the many princelings, and was generally preoccupied either with asserting fantastic claims of world-sovereignty which had no foundation in fact, or in advancing the fortunes of his own family.

In the year 1273 an obscure count, Rudolf of Hapsburg, was offered the Imperial crown, to the chagrin of King Ottokar of Bohemia, who had hoped for it himself. This proved to be a turning point in German history, for Rudolf greatly extended his family territories (having killed his rival, Ottokar, and annexed his lands) and so laid the foundations of Hapsburg power.

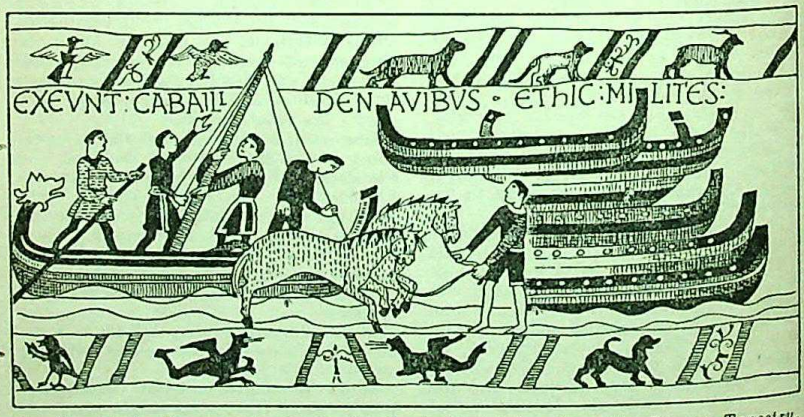
The Hansa towns of North Germany, and the Free Imperial Cities, were virtually independent of Imperial control, although the Hanseatic League was careful to defer to the Emperor in theory if not in fact. The Emperor Charles IV (1347-1387), a strange grandson for the visionary Henry VII (see Chapter XXV), confined most of his energies to consolidating his position, and he issued the "Golden Bull" of 1356, which settled the manner and method of the Imperial elections, deciding who were the Electors and giving them such powers that he converted them into a feudal oligarchy.

The Swiss Confederation.—In the meantime, a gallant struggle for independence had been going on within the boundaries of the Empire. The sturdy mountaineers of the forest cantons of Uri, Schwytz and Unterwalden had banded together and in 1291 formed a league for mutual defence against the aggressions of their Hapsburg overlord. A large force was sent under Duke Leopold of Austria to punish these mutinous peasants, a force composed of knights and nobles who thought nothing of the ill-armed peasants, but who were nevertheless routed by the skill and courage of those peasants on the steep mountain-side of the Morgarten (1315).

The Swiss had shown that a small band of resolute infantry could vanquish an equal number of mounted knights with their clumsy accoutrements, as the Flemings had shown at Courtrai (1302) and the English would show at Crécy (1346).

Other cantons joined the league in 1353, and the Hapsburgs began to realize that the Swiss confederation was more than a mere name. In 1386 the Swiss repeated at Sempach their victory of Morgarten, and the spirit in which they fought this battle is shown by the story of Arnold von Winkelried. Rushing into the forefront of the battle and crying "Look after my wife and children," he gathered all the spears within reach and thrust them through his body, so

*It was finally lost to England in 1558.



Landing of the Normans in England. An incident taken from the Bayeux Tapestry, formerly believed to be the work of Matilda, the Conqueror's consort

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

clearing a space for his friends to swing their axes and hatchets.

By such resolution and courage did the Swiss win recognition for the "confederation," which would develop into the compact and sturdy republic Switzerland has ever since remained.

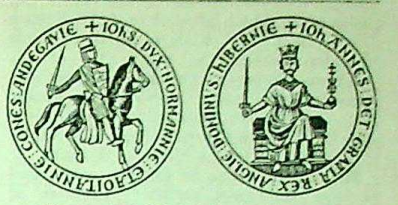
ITALY.—It is impossible to treat the history of Italy in the Middle Ages as a whole, nor can any general thread be traced in the intricate pattern presented by the various city-states. The most that can be done is to indicate various tendencies which, at different times, may be observed. The five most important cities were Venice, Florence, Rome, Naples and Milan, and a study of their various histories will reveal the greatest diversity and complexity.

The Venetian Republic.—Venice, from her position on a network of islands, cut off from the mainland by lagoons and salt marshes, was essentially a sea power, and so escaped many of the entanglements and quarrels of her neighbours. Her position, too, admirably fitted her for developing trade with Byzantium and the Levant, so that she rapidly built up great prosperity.

Rivalry with Genoa led to fierce warfare, which raged intermittently in the thirteenth and fourteenth centuries. For some time Genoa held her own, indeed at one time she had the upper hand, but in 1380 the War of Chioggia brought her ruin. From this time forward, Venice was the richest and most luxurious of all European cities, until the discovery of new trade routes wrecked her prosperity. In the fourteenth century, however, that time was yet distant, and the Venetian Republic, with its admirable government of Doge and Council, its factories and warehouses, its beautiful city, its palaces and its glorious cathedral, was the envy of the world.

Florence.—From early times Florence was the home of art and culture, and yet no city was so torn with faction and internal strife. To the bitter feuds between Guelfs and Ghibellines, opponents and supporters of the Empire, Florence added her own faction fights between "Blacks" and "Whites"—strife of a personal rather than political significance.

The earlier democracy gave place in time to the despotism of the heads of the Medici family, a despotism exercised with the aim of making the city a place of learning and enlightenment. The Medici were generous patrons of the arts and in consequence Florence became the most beautiful of cities, and her buildings and pictures and statues were the admiration of all. The greatest of all Florentines, the poet Dante, was exiled from his native home (see Chapter XXXV) and ended his days in misery far from his beloved Florence, while more



The seal of King John of England

fortunate or more discreet citizens toasted and sang at their delightful banquets, and feared no penalties save those of the sumptuary laws.

Rome, the "Eternal City." — Rome could never forget that she had once been the centre of the world. Arnold of Brescia had dreamed of making her a Free City, but his schemes were too visionary and his opinions were adjudged heretical, so he was burned at the stake and his ashes cast into the Tiber in the year 1155.

With the removal of the Papal court to Avignon in 1309 came the opportunity for Rome to take her rightful place, but she had too long accepted the domination of the Papacy, and the Roman citizens were too turbulent, and the Roman nobles too selfish, to join whole-heartedly in any scheme for regeneration.

One attempt was made and, by the fiery vision which inspired it, came for a moment near success. A young Roman, Cola di Rienzi, who had spent his short life in passionate study of the classics and antiquities of Rome, believed that he might revive Rome's past grandeur. He was persuasive and eloquent, and when in 1347 he raised the banner of revolt, he found many followers. The suddenness of his movement brought it immediate success, and Rienzi proclaimed the Holy Roman Republic. The position he had won without a blow, Rienzi could hold only for a few months. The nobles, who detested him, circulated false rumours which incensed the fickle mob against their leader, and his own extravagances and vanity did the rest. In 1354 he was murdered, and with him there perished his vision.

Naples and the South.—The history of Naples in the Middle Ages is a gloomy record of murder and massacre, plot and counterplot, interspersed with brilliant intervals when the Norman and Hohenstaufen rulers held their courts.

When Conradin, the last of the Hohenstaufen, died in 1268, Naples and Sicily passed to Charles of Anjou, the brother of St. Louis IX of France. The harsh rule of the French provoked the excitable Sicilians to a terrible revenge. At Palermo, in 1282, there broke out on Easter Monday a ghastly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

massacre in which more than 4,000 French men, women and children perished. This massacre earned the grim title of the "Sicilian Vespers," and its result was to transfer Sicily from Angevin to Aragonese rule. In Naples, however, the Angevin dynasty continued until 1435, when Naples was conquered by the House of Aragon.

Milan.—In Milan is seen an early, and perhaps the most striking, example of despotic rule which would become more common in the next century and which did so much to foster the Renaissance in its various manifestations.

In many of the North Italian communes power was beginning to pass into the hands of one particular family, and in Milan control of the city was in the fourteenth century vested in the Visconti, whose crest was, appropriately enough, a viper. The most distinguished of a cruel, ruthless, yet able, family was Gian Galeazzo Visconti. It was his plan to found a kingdom in North Italy, and he stretched out his territories, annexing town after town, until his boundaries included Verona and Vicenza to the east, and Pisa and Siena in the south, so that he was on the point of absorbing Venice and Florence as well. His schemes were cut short by his sudden death in 1402, and his lands, acquired by murder, force and bribery, at once fell to pieces.

The Italian despots, often personal cowards (as Gian Galeazzo himself), employed mercenary captains and their bands to work out their schemes. This saved them the expense and danger of a standing army. The mercenaries were known as condottieri, and in the fourteenth and fifteenth centuries they became of the greatest importance in Italian politics, and even set themselves up as despots, Milan itself falling to Francesco Sforza, the most famous of them all.

THE FRINGES OF EUROPE. — On the eastern border, Europe was in the fourteenth century slowly recovering from the ravages of the Mongol tribes. Russia was beginning to develop its individual character, though still subservient to Mongol overlords, and by the middle of the century the foundations of Moscow's future greatness had been laid. Hungary was a strong state, and leader of the opposition to the steadily advancing Ottoman Turks. Poland and Lithuania, united in 1386, had spread their power into western Russia, but this state was composed of warring elements and held the seeds of dissolution. In Scandinavia there was rivalry between Denmark and the Hanseatic League. By the Treaty of Stralsund (1370), the Danish King Waldemar "Atterdag" was forced to respect the rights of the Hansa, but he did not give away the power he was laboriously building up in his compact little state. In 1397 the Danish sovereign, Queen Margaret, inherited Norway, Sweden and Finland and united all four countries into a great Scandinavian state (by the Union of Kalmar) which promised to become very powerful and in which signs of internal dissension did not immediately appear.

Spain and Portugal.—The Mohammedan conquest of Spain is referred to in Chapter XXIV. Only in the north was effective resistance offered to the Moors, in the mountain districts of Leon and the Asturias, in Navarre and in Castile. The Moors were tolerant as conquerors, and there was no bitterness between Mohammedans and Christians, save in so far as the Christians resented the forfeit of the estates they had done so little to protect. By degrees they began to win the country back from Mohammedan rule, but it was a tedious business, and it was not until 1492 that reconquest was finally accomplished.

Spanish history provides two of the most attractive and typical of chivalrous heroes of the Middle Ages. The first, chronologically, is a Castilian noble known as "The Cid," famed far and wide for his courage and success in battle. He cared little whether he served Moor or Christian—"All kings are alike to me so long as they pay my price!"—but he won for himself part of the province of Valencia and so laid the foundation of Christian dominion there.

The other hero had a dark as well as brilliant side to his character, for he was as violent as he was generous and as cruel as he was kind, as licentious as he was pious, gay, handsome and chivalrous. This typical yet anomalous character was James "the Conqueror" of Aragon (1213-1276); he once said: "I am not a lion or leopard," but he had the qualities of both, and by his courage and his cunning he won back a great part of Mohammedan Spain.

As for Portugal, Lisbon was recovered from the Moors in 1147 by French and English Crusaders *en route* for the Holy Land, and became the capital of the new kingdom.

XXXIV

MEDIEVAL TRADE AND COMMERCE

The Towns.—It would be hard indeed to over-estimate the importance of the towns in the social and commercial life of the Middle Ages after the Roman cities had become obliterated. At first they were simply fortified places of refuge, like the "burgs" founded by the English King Alfred (871-901), where flocks and herds could be driven and kept in safety from raiders and robbers. As time passed, these settlements became

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

permanent, the earthen ramparts were replaced by city walls,* and the towns began to assume a life of their own. By the eleventh century they were seeking concessions and charters from their feudal lords; by the twelfth the cities of Lombardy were strong enough to oppose the Emperor's schemes and even the powerful Frederick Barbarossa (1152-1190) was glad to make peace with the "Lombard League" in 1183 after many years of war with the rebellious "communes."

As the towns grew in size and importance, so did trade grow and flourish, and this in its turn helped the development of towns situated on the chief trade routes and waterways, or possessing good natural harbours. The towns began to grow rich, and so attracted the unwelcome and covetous attention of neighbouring landowners. To protect themselves against the exactions of king, baron or prelate, the towns formed alliances or leagues, for mutual protection against aggression and violence.

The most famous of these was the Hanseatic League, an association which included all the most important North German cities, with Lübeck at their head, and established factories and depots in many more. At the height of its power, the Hanseatic League had more than eighty members, and was strong enough to force the Danish king to recognize its rights and privileges by the Treaty of Stralsund (1370).

Apart from some of the Italian cities, and the "Free Imperial Cities" of Germany, most of the towns were very small, but each had its own merchant guild and its guild hall where the wardens would meet and regulate the affairs of the town as far as buying and selling were concerned. "Non-guildsmen" were jealously excluded, or exposed to such high tolls for permission to buy and sell that it was not worth while for a stranger to make the attempt.

As trade developed and became specialized, each "mystery" or craft formed its own guild, and this second type of guild, the "craft-guild," with its threefold membership of apprentices, journeymen and master craftsmen, gradually superseded the older merchant guild. Every detail of trade was regulated, and offenders were rigorously punished. Elaborate rules were devised to keep up the standard of workmanship, and cheating or slovenly work was considered a slur upon the whole craft.

The Theory of Just Price.—Prices were regulated in a sincere attempt to find an ideal price—the "just price"—which would be equally fair to both buyer and seller. Buying up goods on the way to market and then selling at a profit ("forestalling"), or retailing at a profit from a large stock bought as a speculation ("engrossing"), or holding back goods until the price should rise ("regrating")—all these were serious offences. Lending at interest was forbidden by the Church; usury was left to the Jews, or to Christians careless of their salvation. All these restrictions tended to hamper trade, and the difficulties and dangers of transport were more than formidable, yet the towns flourished; guild halls and warehouses and churches were built by the guildsmen, and endure today as witnesses to their prosperity.

Fairs and Markets.—Only at fair time, and to a lesser degree on market days, were these restrictions relaxed. The right to hold a market was eagerly sought, for it would mean a steady income from the tolls paid by stall-holders, as well as fines from wrong-doers. Surplus products from neighbouring manors would be sent to the market towns once or twice a week, and there exchanged for goods brought from a distance, five cheeses for a bag of nails, and so forth.

Some towns had the right to hold fairs once or twice a year, and thither would flock men of all nations intent upon selling or exchanging the commodities produced by their own districts. In the days of Justinian (527-565), merchants from every country attended the fairs of Thessalonica and Byzantium, but by the twelfth century by far the most important fairs in Europe were those of Champagne. There were other great fairs in Germany at Aix-la-Chapelle and Frankfurt, in the Netherlands at Ypres and Bruges, in France at St. Denis, in England at Stourbridge, in Italy at Venice and Bari, and a little later on at Novgorod in Russia—the greatest of all.

In Champagne the fairs followed one another almost continuously from January to October, each lasting between sixteen and fifty days. The most important were held at Provins and Troyes, which enjoyed the privilege of holding two each year. The Count of Champagne encouraged and welcomed merchants, and gave them his promise of safe conduct. He appointed, too, officials known as "gardes des foires" to maintain order and to collect tolls.

Merchandise of every kind was piled upon the wooden stalls—cloth from Flanders and England and Italy, silk from Lucca or Provence, furs and amber and timber from the North, wines from Greece, leatherwork from Cordova, carpets from Turkestan, jewellery from Byzantium. The fairground was the meeting point of East and West: it was here that the new and vigorous society of the North came into contact with the orientalized Southerners. It was said that fifty languages and dialects could be heard at the same time, and men of all races

* At Wareham in Dorset, these earthen ramparts are still clearly visible.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

jostled each other and bought and sold and gambled and enjoyed themselves.

The money-changers had to accept and count and assess a multiplicity of coins, for currency was liable to be debased by any ruler temporarily short of funds, and every ruler had a fancy for issuing a new coinage. As money was as scarce as it was varied, bills were often used since they were safer and less bulky. These would be settled at the close of the fairs. Some merchants arranged for supplies to be paid out to them by means of bills on the various stages of their journey; this saved them the embarrassment of carrying heavy money bags, safeguarded them against robbery and prevented them from gambling their capital away in wayside inns before reaching the fairground. It gave an impetus to the new business of banking; the first bank was founded in Venice in 1156, and soon Florence and Pisa became the leading cities in banking.

In the former the principal bankers were the great art patrons: the Bardi, the Peruzzi and the Medici. They were buyers and sellers of bullion and credit, and their operations were both local and international. The Florentine artist or craftsman wanting an advance to purchase marble or raw silk could command their services as well as the King about to launch a military campaign. The commonest coin for international currency was the silver bezant.

The fair of Troyes dates back to the fifth century, but it was in the eleventh, twelfth and thirteenth centuries that the fairs of Champagne were at their height; after this their importance began to decline, largely owing to the effects of the Crusades, and the opening of fresh markets.

Medieval Trade Routes.—Common sense urged those in charge of valuable merchandise to organize themselves into caravans or strings of packhorses with armed guards. Robbers abounded; no road was safe by night and few by day, and in addition to the ordinary perils of the road from avalanches, precipices, flooded rivers and tempests, the landowners through whose territory the merchants were obliged to pass sometimes exacted enormous tolls.

From the Far East, from India and the Spice Islands and Cathay (or China), precious drugs and spices were brought to the Mediterranean ports of Alexandria, Antioch and Tyre, where they were bought by Venetian or Genoese merchants and reshipped for Venice or Genoa. Carpets, silks, ivory and precious stones were to be bought there too, some of the merchandise transported overland on camels for hundreds of miles, some brought across the Indian Ocean to Ormuz in the frail junks which so filled the Polo brothers with alarm that they refused to entrust themselves on board.

The Arab traders bartered their Eastern goods for the products of north-western Europe, and the buyers sent the precious packages by sea to Marseilles and thence across France, or to Venice or Genoa and thence over the Alps to Central Europe. The ginger and cinnamon and nutmegs and spikenard, and diaphanous silks and embroideries were loaded into bales and were fastened on to packhorses and so sent out upon their hazardous journey.

Crossing the Alps in medieval times was a dangerous and terrifying business. A Canterbury monk wrote to his sub-Prior in 1188 a description of his passage of the Great St. Bernard pass,* calling it "a place of torment . . . where the marble pavement of the stony ground is ice alone, and you cannot set down your foot safely . . . my beard was stiff with frost, and my breath congealed into a long icicle." Another Englishman, Adam of Usk, had to be blindfolded by the guides lest he should see the horrors of the pass when he was making his way over the St. Gotthard. From Genoa the route lay over the Great St. Bernard or Mont Cenis pass and so to Lyons, but most of the Venetian merchandise was sent over the Brenner.

Waterways were used to a great extent, particularly the three rivers, the Danube, the Rhine and the Rhône. Barcelona and Marseilles controlled most of the trade with northern Africa and the Balearic Islands, and they and the chief Italian cities held a monopoly of Mediterranean trade, just as the cities of the Hanseatic League controlled the North Sea and Baltic fisheries. Merchants from other nations, especially Bretons and Englishmen, tried to cut into these monopolies, but with little success until Brittany specialized in making sailcloth and England captured the whole of the Flemish market for her wool.

Merchants and Traders.—Stories of the marvels and incredible riches of the Far East had reached Western ears from the lips of Arab traders, but until the middle of the thirteenth century, no European had succeeded in visiting Cathay to see for himself if such wonders could really be. The missionary friar Carpini had been sent as an envoy to the Mongols (see Chapter XXXII) in the year 1245, and in 1260 two Venetian jewel-merchants, Nicolo and Maffeo Polo, set out to visit the Great Khan's court to see if they could open up markets for their goods and bring back some of these Eastern products.

* There was a hospice here, for the benefit of pilgrims and other travellers, founded by St. Bernard of Menthon (not to be confused with St. Bernard of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In 1271 they set out a second time, taking with them Nicolo's son, Marco, who afterwards wrote an amazing book about their travels, filled with sober truth which his contemporaries found incredible. They were received most kindly by the Great Khan, Kublai. Marco wrote afterwards in his book that Kublai must have "the secret of the alchemists," for he was able to produce money from paper. The Polos were much impressed by the bank-notes, printed at Kublai's orders, which passed as currency all over his realm.

Marco Polo was delighted to find in "Kinsai" (Hangchow) a beautiful city with lagoons and canals like his native Venice, and could "imagine himself in Paradise." For seventeen years he remained in the Khan's service, observing and taking notes, and never failing to take his opportunities for trading, for he was a true Venetian. At last, in 1295, the Polos returned, travel-stained but triumphant. Marco told his true but astonishing stories with such emphasis that he won the nickname of "Il Milione," and his book of travels received less credence than the atrocious exaggerations and "marvels" compiled by Sir John Mandeville early in the next century.

Some thirty years later an Arab trader named Ibn Batuta set out on pilgrimage to Mecca, making his way thither across North Africa from Tangier. He afterwards crossed Arabia, Persia and India, and ultimately reached China, which he found "the pleasantest place on earth." The Polos had pointed the way for Christians, and Ibn Batuta for Moslems, but by the middle of the fourteenth century wars and rumours of wars had the effect of closing trade routes to the Far East, and until the great geographical discoveries of the fifteenth and sixteenth centuries offered alternative routes, direct communication with Cathay was closed.

For the remainder of the Middle Ages, trade and commerce were turned back into the old channels. Acute rivalry between Venice and Genoa led at last to the triumph of Venice, who at the end of the period began to send a proud fleet of galleys sailing out through the Straits of Gibraltar and up the coasts of Spain and France to England and Flanders. The North Sea herrings forsook their old haunts and took to new feeding grounds farther west, and this meant the decay and ruin of those Hansa towns which depended upon fishing and the export of herrings for a livelihood. The wool trade increased in England, as did the wine trade in France. In Flanders, Bruges began to become a serious rival to the Italian towns. The Florentine cloth trade, managed by the guilds of the Calimala and Arte de Lana, still had the reputation of keeping up the highest standard, but rivals were beginning to threaten it.

The Levant trade continued and increased. A Florentine merchant named Pegolotti wrote a valuable book of advice for merchants (in 1345), describing exports and imports, and how to pay and when to pay and how to bribe; it gives an excellent picture of the methods and aims of medieval trade, and it should be consulted by anyone interested in this subject.*

XXXV

THE CIVILIZATION OF THE MIDDLE AGES

Architecture and Sculpture.—In none of the arts is the spirit of the Middle Ages shown to better advantage than in Gothic architecture, and the noble buildings scattered over Europe are enduring monuments to all that is best in medievalism.

The first Christian churches were modelled on the ancient basilica or law-court,† and even today ecclesiastical architecture bears traces of this origin. Byzantine influences superimposed on this style the idea of a great central dome, as in the church of San Vitale at Ravenna, and, more famous still, Santa Sophia at Byzantium (see Chapter XXII). The Byzantines decorated the interior of their churches with the richest and most glowing materials they could find, so that they looked like glittering caves lined with gold and jewels.

Mohammedan architecture, too, relied on ornament for its effect. (See Chapter XXIV.) Meanwhile, Western Europe was evolving a style which had no equal for rugged grandeur, and depended for its effect upon proportion and clean simplicity of line rather than upon exquisite workmanship. This style is distinguished by its round arches and its massive pillars supporting the "barrel"-vaulted roof; it is known to us as "Norman," and is seen to advantage on both sides of the Channel.

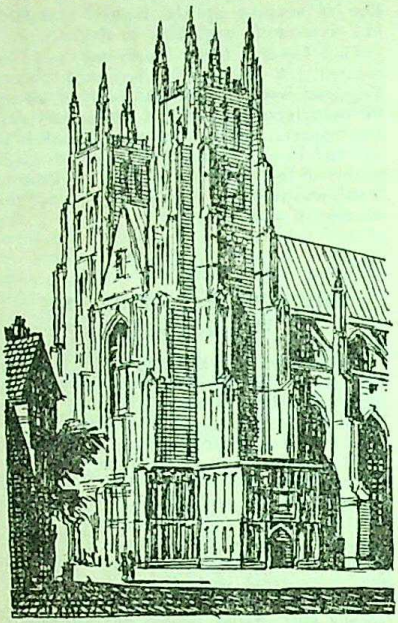
About the twelfth century the pointed arch was introduced, and this meant a great development, for it made possible the elaborate vaulting and tracery which is the distinguishing beauty of "Gothic" work. The chisel began to replace the axe, and with improved tools finer and more delicate carving of stone could be carried out. The exquisite "foliage" capitals of Lincoln and Ely Cathedrals in England, the figures of Chartres and Rheims, and the beautiful west front of Amiens all belong to this period.

* *Cathay and the Way Thither*; Sir Henry Yule (Hakluyt Society), 2 vols. 1866. Vol. ii.

† This style is known as Romanesque; the most striking example is St. Ambrose, Milan.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Cathedral Church of Christ, Canterbury. It was begun by Lanfranc in 1070

In Germany and Italy Gothic architecture did not flourish to the same extent, and here, as in France, the development of detail led to ornament for ornament's sake. In England the "decorated" style made way for a return to simpler and more constructive lines, but it was only in England that the "perpendicular" style took root;* elsewhere Gothic architecture became ornate and unprogressive, waiting for the Classic revival of the next century.

As to military architecture, many of the great medieval fortresses remain today very much as they were in the eleventh and twelfth centuries, but there are still more which stand as ruins, testifying to the power which wrecked them. It is said that small cannon were first used at the Battle of Crécy (1346); it was this invention of artillery and the use of gunpowder which finally destroyed the feudal castle. Nevertheless, there are still to be seen fortifications such as those of Carcassonne (in this case greatly restored), which testify to the amazing strength and solidity of the works.

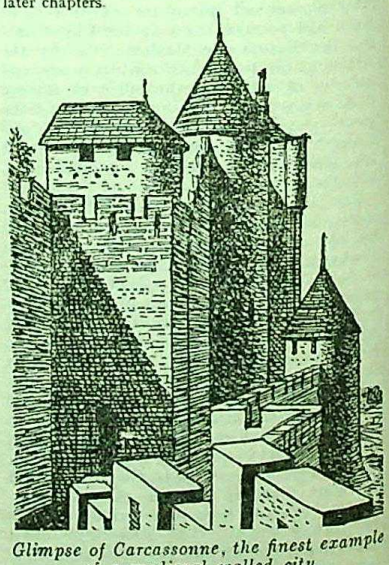
Of the domestic and civic architecture of this period little remains that has not been changed out of all recognition. It is by their churches and cathedrals and monasteries that medieval builders must be judged, and who can deny that theirs was a noble inspiration?

Music and Painting.—Those works of art, in both music and painting, which have survived from the Middle Ages, are nearly all ecclesiastical in character. Some of the folk-songs* survive in traditional airs, but it is difficult to trace their origins. From the sixth to the eleventh century, and from then till today with slight modification, ecclesiastical chanting followed the "Gregorian" style. Pope Gregory the Great (590-604) had collected all that he could find of the ancient Greek melodies and formed the antiphonary used by the whole of the Western Church.

Musical instruments of the Middle Ages did not greatly differ from those now in use, though, as might be expected, they were cruder in design. Perhaps the flute was the most popular. As far back as the fourth century St. Jerome (*d.* 420) described an organ, composed of "fifteen brazen pipes, two air-reservoirs of elephant's skin, and twelve large sets of bellows, to imitate the voice of thunder."† St. Jerome lived in Palestine; the wind-organ he describes was not seen in Franco until the eighth century. It soon found imitators, and by the ninth

* Those sung by the German Minnesingers, for instance, in the thirteenth century, were collected and written down in the Codex Manasse.

† This subject is treated much more fully in later chapters.

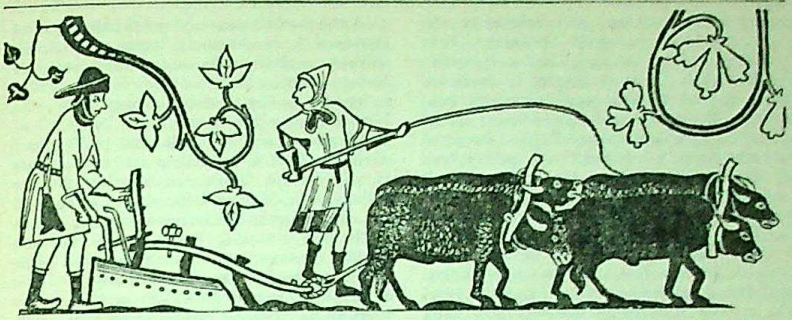


Glimpse of Carcassonne, the finest example of a medieval walled city

* For example the wonderful series of "perpendicular" parish churches in Somerset.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Rural scene from the Luttrell Psalter, the famous illuminated manuscript dating from about 1340

century German organ makers were already acquiring great renown.

Painting* in the Middle Ages (as distinct from miniature painting) generally meant fresco painting. Most church walls were adorned with frescoes illustrating Bible stories and legends of the saints. In the days when books were few, and those who could read them fewer still, worshippers were obliged to learn from the painted and sculptured stories they saw around them in their churches, and these frescoes and carvings formed a picture-book for the unlettered.

A favourite subject for decorating the chancel arch was the Last Judgment; on one side souls being aided heavenwards by angels, on the other being pitchforked into the jaws of Hell (dripping blood from every tooth), painted in the most lurid colours imaginable. Not all frescoes were of this type; many are quaint and attractive; some painted before 1400 are those by Giotto (*d.* 1337), the shepherd-boy pupil of Cimabue (*d.* 1302), particularly those at Assisi, illustrating the life of St. Francis. The picture of the saint preaching to the birds is one of the most precious and charming of all medieval relics.

The Scriptorium.—Before the days of printed books, manuscripts were so greatly prized that they were handed down from generation to generation, and often classed as heirlooms as though they were plate or jewels. Many were of great beauty and brilliance, with illuminated borders and miniatures or "vignettes," tiny pictures exquisitely painted. In most libraries they were chained to their stands for safety, a necessary precaution.

The manuscripts were written on parchment or vellum, for the art of paper-making, known to Egyptians and Chinese, had not yet been discovered in Western Europe. They were written on carefully ruled sheets, with a quill pen and ink made from blackthorn bark. Initial letters were often of gold leaf, burnished till it shone, and important words were rubricated.

In the early Middle Ages, indeed up to the middle years of the fifteenth century, professional scribes are seldom found. The monasteries were the great centres of book production; one of the most famous was the scriptorium at Bobbio, and many precious MSS. were written there. Some, in imitation of Byzantine models, were written in letters of gold upon purple vellum. It is to the monks as copyists and preservers of ancient classical and early Christian texts that we owe our heritage of culture; without their efforts no doubt many works would have been altogether lost to posterity.

Not all copyists, unfortunately, were good enough scholars to avoid making errors in their work; some writer might wrongly expand a contraction, the next would repeat his mistake and perhaps add others of his own, and so on. In this way, many texts became corrupt, and the human element, the physical weariness engendered by copying many pages of closely written Latin, led to the elision of words and even whole lines of the text. Before the days of printing, perfectly accurate copies were scarcely obtainable, although many of the books were things of enduring beauty, and a monument to the industry, patience and skill of their producers.

The Universities.—Most of the schools in the Middle Ages were monastic foundations, and it was in the cloister that girls learned the music and needlework thought necessary for women's education, and boys were given religious instruction and taught Latin and mathematics, and to read and write.

Those who showed promise, and who wished to become clerks and scholars, made their way to the universities to continue their studies. The word "universitas"

* *The Arts of the Middle Ages*; P. Lacroix, p. 192.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

means a corporation, and originally the university was a guild including both masters and scholars. The universities reached their greatest height in medieval times in the twelfth and thirteenth centuries. The greatest of them all was Paris, "the hearth where the intellectual bread of the whole world is baked." In the first half of the twelfth century students from all nations were flocking thither to hear the lectures of Peter Abelard (see Chapter XXIX).

Second only to Paris was Bologna; this was the home of Roman Law, while Salerno and Padua specialized in medicine. Cordova, Oxford and Montpellier were all flourishing universities at this time, and as Latin was the language everywhere spoken and understood, it was possible for a student to pass freely from one university to another, beginning his course in one place, continuing in another, and finally taking his M.A. in a third. It would take him eight years to become a Doctor of Theology.

The universities were only loosely organized at first, and the "College" system had hardly begun to take shape. A few hostels were provided for students, generally through the generosity of some benefactor who would give or bequeath an endowment for that purpose, but as a rule the students lodged how and where they could and attended what lectures they chose, attaching themselves to some Master of Arts who would arrange their studies and give them tuition in return for their fees.

Riots often broke out between townsmen and students, and fights between scholars of different races. Many were pitiably poor, and they were often given licence or permits to beg. Some broke away from the universities and roamed the countryside, earning a precarious living by their wits and by writing and singing lyrics of their own composition. Life in a medieval university was varied and full of colour, and provided a grand training for the acute philosophical discussion which was meat and drink to the medieval mind.

The foundation of colleges seems to have been a consequence of the settlement of the friars, both Dominican and Franciscan, in university towns in the early part of the thirteenth century. They were monastic establishments, and from the gifts of those who took vows of poverty on entering, and from other endowments, were built the halls, chapels and libraries.

Medieval Poetry.—As books were scarce, and few could make use of them, many of the songs, tales and metrical romances were handed down by word of mouth. This gave them great flexibility, and accounts for the great variety and widespread occurrence of the most popular themes.

In the twelfth century the troubadours of Provence wove charming lyrics of love and chivalry, and their imitators wandered over Europe, singing their ballads in castle halls, at court, or by humble camp fires. In France their songs were of the "gestes" of Charlemagne and his Paladins, in England of the deeds of King Arthur and the knights of the Round Table, or stirring Border ballads of fighting and the chase; in Iceland and Scandinavia the Heimskringla or Sagas of the Norse kings. By the middle of the twelfth century, the "Nibelungenlied" had taken its final shape in Germany, a cycle of heroic poems of great charm.

Some of these metrical romances were written down; in England we are fortunate enough to possess an example in the story of "Sir Gawaine and the Green Knight," which deserves to be far better known. Many more are irretrievably lost, or linger on only in the folk-tales which still survive in an emasculated form in the remotest corners of Europe. There are, however, certain great epics of medieval literature which are so well known as scarcely to need mention.

Pride of place must be given to the *Divine Comedy* of Dante Alighieri (*d.* 1321), written in the bitterness of exile, in which he makes an imaginary journey through Hell, Hades and Paradise in the company of his mentor, Virgil. He recognizes friends, enemies and heroes of antiquity and has left to posterity an invaluable commentary. A far greater insight into medieval history can be gained by reading the *Divine Comedy* than by perusing a dozen textbooks; moreover it stands high among the greatest poems ever written.

It is significant that Dante chose to write his greatest work in the vernacular instead of the conventional Latin. This was a symptom of the increasing development of nationality overspreading Europe at the time. Some years later another Italian, Giovanni Boccaccio (*d.* 1375), wrote, also in the vernacular, a delightful collection of tales known as the *Decameron*. This may have suggested to the Englishman, Geoffrey Chaucer (*d.* 1400), sometimes called "the father of English poetry," his entertaining *Canterbury Tales*, with their delicious touches of dry humour in the description of typical characters of the time. Many great names must be omitted; it must suffice to mention only one more poet, the great Petrarch, who was crowned Poet Laureate in Rome in 1341, and who stands with Boccaccio on the threshold of the Renaissance and yet carries on the noble tradition of Dante from the Middle Ages.

Conclusion. — In many ways the fourteenth century is exceedingly interesting. It holds the seeds of the period of intense

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mental and physical activity known to posterity as the Renaissance. From one point of view it was the apotheosis of the Middle Ages in art, in literature and in thought, yet it was the prelude to a great new phase.

It was a time of unrest, as is shown by the strange outbreak of republicanism which developed all over Europe. After centuries of acquiescence in a wretched and oppressed life, the peasantry of Europe began to demand newer and fuller powers, and to cast aside bovine acquiescence and to think and act as human beings with immortal souls. The "Jacquerie" in France (1357-58), the rising of the Flemish weavers under Van Artevelde in Flanders (1338), the rising of the Ciompi in Florence (1378), the Peasant Revolt in England (1381) and perhaps the gallant struggle of the Swiss mountaineers (see Chapter XXXIII), all these are instances of this new spirit.

Matters were precipitated by the terrible calamity which swept across Europe in the year 1348, disregarding all frontiers, respecting no persons. This was the epidemic of bubonic plague, known as the Black Death. It may have originated in China; it swept across Russia and the Crimea and ravaged Armenia and Asia Minor. In Europe victims fell before the pestilence like autumn leaves in a gale, and in every country this terrible plague took a heavy toll of the population and led to great social, political and economic changes, far-reaching in their consequences.

In conclusion, the fourteenth century was an age of strange anomalies, of brilliance and squalor. Although this century retained many of the most characteristic institutions and ideas of the Middle Ages, from this colourful period onwards it is possible to trace the growth of modern opinion, and many of the ideas claimed by the twentieth century have their origin five hundred years before.

XXXVI

THE RISE AND FALL OF BURGUNDY

The Middle Kingdom.—When, in 843, the Empire was divided among the grandsons of Charlemagne, the eldest of them, Lothair, received the middle strip between the modern France and Germany, stretching from the mouth of the Rhine southwards to Rome. Aggression from both sides wore the kingdom away, until by the fourteenth century nothing of it remained except the much-disputed province of Lorraine.

It was a generous impulse on the part of the French king, followed by a singular chain of coincidences, which led to the revival of this ancient state in the fifteenth century, and very nearly resulted in a powerful and vigorous middle kingdom which must have changed the whole course of European history. In the year 1361 King John of France bestowed on his youngest son, Philip "the Bold," as a reward for his bravery at Poitiers, the Duchy of Burgundy. This fief had fallen to the Crown, and King John little thought that he was founding a state which within three generations would be scheming to overthrow the French monarchy.

Philip married the heiress of Louis de Mâle, Count of Burgundy and also of Flanders, Nevers, Rethel and Artois, so that on the death of Louis in 1383 the Duchy and County of Burgundy became reunited for the first time since the ninth century and, added to the important lands in the Netherlands, formed the nucleus of a powerful state. The dukes of Burgundy contrived to annex provinces by marriage and by treaty, among them Holland, Hainault and Brabant. Under Philip "the Good" (1419-1467), the frontiers were extended in many directions, and he made his court the most brilliant in Europe.

Where Philip was cautious and patient, his son Charles "the Bold" was violent and impetuous; the chronicler Philip de Commines aptly described* Charles as "le sanglier." The wily King Louis XI of France, "the Spider," who reigned from 1461 to 1483, was more than a match for Charles, and thwarted his ambition to take the title of king. He stirred up strife, too, among Charles's subjects, which the Duke did nothing to allay by his high-handed conduct.

There was great hostility to Burgundian rule in Swabia, and in 1474 war broke out. The Swiss showed again the courage which had won them their independence, and although Charles fought with great determination, his troops were defeated again and again. At last Charles himself was killed at the siege of Nancy in 1477, and with him perished the danger which France and Switzerland had both so greatly feared.

The task Charles had set himself had proved too complicated for his abilities, and he had a distressing habit of alienating the sympathies of those whom he most wanted to win. Charles left no son; on his death his dominions passed to his daughter Mary, who married the Hapsburg Emperor Maximilian. France recovered the Duchy of Burgundy, but most of the other lands were transferred to German rule. Thus ended the attempted revival of "the middle kingdom."

* In his *Mémoires*; an admirable account of French, English and Burgundian affairs by a shrewd and far-seeing observer.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Burgundian Court.—In the days of Philip the Good and Charles the Bold, the Court of Burgundy was the home of chivalry and pageantry. In the fifteenth century the tournament reached its height, and began to be hedged about with rules and ceremonial. Jousts and tourneys between mounted knights were held on all important occasions, an exciting and beautiful spectacle for the populace, a thrilling occupation for the nobly born.

These mock fights, or "combats," were held in all countries and at all times throughout the Middle Ages, but they reached perhaps the peak of their development in the middle years of the fifteenth century. The massed tourneys were less popular than jousts, or single combat with swords or axes. When Charles the Bold married Margaret, sister of the English King Edward IV, in 1468, the occasion was celebrated by the most gorgeous of tournaments, when the very trappings of the horses were of cloth of gold, and bells of pure gold tinkled on their bridles. Many lances were broken in the lists that day, but no serious casualties were reported.

Feasting, too, was on a lavish scale, the wedding supper lasting until three the next morning. More than a thousand casks of wine were needed yearly to assuage the thirst of the Duke's courtiers. Everything was of the most gorgeous; "from prayer book and sword down to children's toys and toothpicks, everything was overlaid with gold and silver, or sparkled in a blaze of jewels."*

Poets and craftsmen thronged the court, and some of the greatest artists of the day designed tapestries and painted portraits for the Duke and his family. Hubert and Jan van Eyck painted at this time the wonderful altarpiece which still hangs in Ghent. Albert Dürer called it, "a most precious painting, full of thought." Jan van Eyck also painted many portraits; his well known "Giovanni Arnolfini and his wife" may be seen in the National Gallery in London. Rogier van der Weyden, too, painted fine portraits, and he and the van Eycks built up the Flemish school of painting. Even the Italian artists were willing to learn from these Netherland painters, and a Milanese was sent by his patron to work for several years in the studio of van der Weyden. Examples of Burgundian art spread over the whole of Europe.

In Burgundy we find the last brilliance of the Middle Ages fading before the splendour of the Renaissance. The love of pageantry and tournaments is common to both periods; there was a recrudescence of it on the occasion of the "Field of the Cloth of Gold" in 1520, when Henry VIII of England and Francis I of France held their famous meeting. Yet it is to Italy and the Italian courts that we must look for the real inspiration of the Renaissance; the brilliance and culture of Burgundy are rather the apotheosis of medievalism.

* Cartellieri, "The Court of Burgundy."

XXXVII

THE MONGOLS AND THE TURKS

In the year 1405, years after the Battle of Angora (see Chapter XXXII), Tamerlane died and the world was well rid of a bloodthirsty tyrant. The smoking ruins of cities and great areas of devastated lands bore silent witness to his career of terrorism, but he achieved little that was permanent, and the dynasty he established survived him by only fifty years.

A very different type of Mongol ruler was Akbar the Great (1556-1605), and some of his ideas and methods have been adopted into the English system of government and bear fruit at the present day.

The Reign of Akbar (1556-1605).—On his father's side, Akbar was descended from Tamerlane, on his mother's from Jenghiz Khan, and from them both he inherited a great military tradition. But Akbar had far more in common with Asoka, "the peace-lover" (see Chapter VI), than with those fierce warriors. He was a fighter, and an excellent fighter, when fighting was necessary, but he was a humane conqueror. Even Tamerlane had spared the artists in the cities he conquered, but Akbar took no delight in human bloodshed, and exercised his animal spirits in large-scale hunting of wild beasts.

As a conqueror, Akbar extended his dominions from Afghanistan across all Northern India, and annexed kingdom after kingdom until only the Deccan in Southern India defied his power. It was, however, as a ruler that he achieved his most remarkable results. He showed an extraordinary tolerance, a tolerance as wide as that of the Hohenstaufen Emperor Frederick II (see Chapter XXV) in choosing the ablest men for responsible posts, whatever their race or religion. He was a shrewd judge of character, and seldom made a mistake.

Akbar developed commerce by every means he could, and regulated his taxes so that they fell equitably, and severely punished unjust and extortionate tax-gatherers. He established schools for the education of both Moslems and Hindus. His justice was everywhere famous; it was said that every man wronged and seeking redress "believes that the Emperor is on his side."

At his capital near Delhi, Fatehpur-Sikri, now deserted and the home only of wild beasts, Akbar built a great and splendid palace where he welcomed foreigners of all

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

races. He loved men of letters and delighted in poets, painters and architects, in drawing and in music. Indeed, the emperor himself was skilled in a number of handicrafts. Of his court a modern writer has said: "If theological disputation and religious animosities were a sign of high civilization, these rivalled in fierceness those of Western countries; but while in Europe the disputants burnt or massacred one another in their zeal, and devastated whole countries in the name of religion, here in India a restraining power prevented arguments from ending in the use of swords; here was a monarch who actually believed in toleration."*

As to Akbar's own religion, he was a Mohammedan, apparently, but he was intensely interested in many other creeds as well. Hindus, Parsees, Jews and even Christians—all were welcome guests. He used to take part in long discussions with the Jesuit missionaries whom he had summoned to his court. They hoped to convert him, and always felt they were on the point of doing so, but he always evaded them, to their exasperation and chagrin. Yet it was a Jesuit who paid the greatest tribute to Akbar's character and rule in describing him as "naturally humane, gentle and kind," and ". . . just to all men."†

The Court of Akbar, with its beautiful palace and gardens, the fountains, the rare shrubs, the stables with his five thousand elephants (which he would personally inspect at frequent intervals), the luxury and oriental splendour—all these combined to present a picture to western minds of a fairy-tale ruler, and legends grew up round his name as they did round that of Caliph Haroun-al-Raschid. (See Chapter VII.) Yet Akbar was no mere lover of show, nor was he so much in love with beauty and culture that he could not find time for the most minute details of government. Nothing was so small or so unimportant that it could escape his notice.

Personally, Akbar must have been most charming. He was singularly kind to the poor and lowly, and "it is noticeable how he makes more of the small presents of the poor (and he is very fond of presents) than of the costly gifts of the nobles, at which he will scarcely glance."‡ There is a delightful picture from a manuscript (of a rather later date) which shows the Emperor, in his favourite short white surcoat and red turban, riding on a prancing elephant. The original may be seen among the Stowe MSS. in the British Museum.

Whether he were receiving distinguished guests, or listening to music, or founding a cannon with his own hands, or interminably discussing religion with Jesuit missionaries, Akbar seemed completely absorbed in his occupation. Fatehpur-Sikri rivalled the Italian city-states at the height of the Renaissance as a home for painters, miniaturists, poets, architects and musicians. Hitherto, the Persian style had been supreme, but in this reign it began to blend with the Hindu and Mohammedan schools, and finally the Persian was absorbed into the Indian. Under Akbar's son, Jehangir, like him a patron of all the arts, the new Mogul school produced exquisite manuscripts of the most perfect workmanship. And yet, in the midst of all this culture, and despite his appreciation and enthusiasm, Akbar—like Charlemagne—never learnt to write. He was a strange medley of characteristics; on only one point are all his biographers agreed—no ruler ever more truly earned the title of "the Great."

Instead of falling to pieces at the ruler's death, Akbar's kingdom endured, for it had been built up by a statesman, not cowed into submission by a tyrant. His great-grandson, Aurungzebe, became master of all Akbar's dominions, and of most of Southern India as well; he is known to posterity as the "Great Mogul."

The Ottoman Turks. — Although the Battle of Angora in 1402 was a crushing blow to the rapidly spreading power of the Ottoman Turks, they soon began to gather strength again and to advance inexorably westwards.

As far back as the year 1389 the Serbians had exhausted their last energies in struggling against the Turks at the Battle of Kossovo, an engagement fought out with the utmost ferocity on both sides. A Turkish writer declared that "the battlefield became like a tulip-bed with its ruddy severed heads and rolling turbans." After Kossovo it was clear that whereas the Serbians—who were deserted in the hour of need by the Hungarians—had shot their bolt, the Turks were able to put more and better armies into the field, and their conquest of Eastern Europe would be simply a matter of time.

For many years before Byzantium fell, the Turks had mixed freely with Christians, even in some cases intermarrying. While they were on friendly terms with the Eastern Emperor, sometimes lending him troops and so forth, yet they continually annexed Imperial territories in Asia Minor and cities in Thrace. The last of the Greek Emperors, Constantine XI, reigned from 1448 to 1453, and he employed the few years of his reign in a desperate struggle against the Turks under their formidable leader, Mohammed II, "the Conqueror."

In 1453 Byzantium fell after a long siege. The previous year, when Turkish hosts first

* See Laurence Binyon: *Akbar.*
† *Ibid.*
‡ *Ibid.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

threatened the city, the Emperor sent an urgent appeal for help to all Christendom, but it fell upon deaf ears. In his anxiety, Constantine offered to comply with the Roman Church on many controversial points, and this offended some of the Greeks, who declared they would rather see "the turbans of infidels in S. Sophia than a cardinal's red hat."

Constantine realized the danger, but Western Europe was apathetic. Pope Nicholas V (1447-1455) sent a few mercenary troops, but they were of little avail. The Turkish Janissaries soon made breaches in the city walls, and in the north-west angle of the city two whole towers and the curtain wall connecting them were demolished by Turkish artillery. The Emperor fought heroically among his men, and fell with them. His body was so mutilated that he could only be recognized by the Imperial golden eagles on his mail shoes. With his death, resistance was at an end.

The Sultan Mohammed II rode through the city in triumph, and entered S. Sophia and bade a mullah repeat from the pulpit the Moslem creed. "So the cry that God was great and Mohammed his prophet rang through the dome where thirty generations of patriarchs had celebrated the Holy Mysteries."*

Not satisfied with the conquest of Byzantium, the Sultan began to turn his attention to the west, and by slow degrees to extend his influence. He coveted Rome, and as a first step he captured Otranto in South Italy. Had he not died suddenly in 1481, at the height of his power, it is impossible to tell what his ambition might not have led him to achieve.

Mohammed II was an enlightened ruler, and did what he could to conciliate his Greek subjects. His successors continued his policy of extending Turkish power eastwards and southwards to Armenia and Egypt, but none of them aspired, as he did, to Rome.

Suleiman the Magnificent, 1520-1566.—This ruler was the most striking, and the most powerful, of all the successors of Mohammed II. He was acknowledged Caliph of the whole of Islam, for he conquered the territories of Baghdad and Algiers and added them to his dominions. Suleiman also extended his power at the expense of Europe, acquiring the greater part of Hungary.

After his death, the Pope, Venice and King Philip II of Spain (1558-1598) formed a Holy League against the Turks, and in the sea battle of Lepanto in 1571 they won a mighty victory. Further wars between Venice and the Turks were indecisive, for the successors of Suleiman were in no way comparable to him, and lacked energy, ability and enterprise.

Towards the end of the seventeenth century, however, the Turks again invaded Hungary and even laid siege to Vienna. But they had reckoned without the Poles, who, under their splendid King, John Sobieski, came to the rescue. The Poles advanced to the Danube, and in 1683 they routed the Turks in a fierce battle before the very gates of Vienna. The Turks retreated in confusion, discomfited, and never again did they venture so far into Europe. With the raising of the siege of Vienna, the chapter of Turkish aggression in Europe is, for the present, closed.

XXXVIII

THE RENAISSANCE IN ITALY

The Meaning of the Renaissance.—The word "Renaissance" is used in a very wide, and often in a loose and inaccurate sense, to cover a great variety of subjects and a period of anything up to two hundred years. Its literal meaning is "re-birth," implying the revival of a profound interest in the past, a passionate interest in the present, and a healthy curiosity about the future.

In fifteenth-century Italy conditions were particularly well adapted to the growth and development of these ideas. After the death of Gian Galeazzo Visconti in 1402 all question of a united kingdom in North Italy was, for the time being, at an end. The country again became divided up into a series of small city-states, presided over by a republican government which was in most cases giving way to the despotic rule of one family. The rise of the despots meant the setting up of little courts, where the ruler was the natural patron of the arts and the friend and protector of craftsmen and scholars.

When, in 1454, the Peace of Lodi brought Italy relief from internal strife, there followed a period of forty years (until the invasion by Charles VIII of France) during which scholarship and the arts had the opportunity they needed to develop under ideal conditions. As far as Italy is concerned, this is the golden age of the Renaissance.

The Italian City-States.—It is impossible to generalize on the subject of the Italian city-states; the chief characteristics of each of the most important must be briefly sketched if the development of the Renaissance is to be made comprehensible.

Florence.—In Florence the republic was notoriously weak and unsteady, since all citizens had a great love of equality and yet every family passionately desired to be first. The ruling class was, in practice, an oligarchy founded on wealth (not, as in

* Oman, *The Byzantine Empire*, pp. 317-18.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Venice, on birth), and this oligarchy regulated taxation, which became in their hands a purely party matter. Gradually the power passed into the hands of the Albizzi and then the Medici, who were far too subtle to claim the title of "Duke." Cosimo (*d.* 1464) and Lorenzo de Medici were supreme rulers, but they never called attention to the fact; they merely taxed their rivals out of existence and kept Florence free from warfare and party strife.

Lorenzo de Medici was himself a scholar and poet, and under his rule (1469-1492) Florence took a leading place in painting and sculpture, in music and poetry. The Platonic Academy was founded with Cosimo's encouragement, and he was friend as well as patron of scholars and artists. The humanist Marsilio Ficino said, "I owe to Plato much, to Cosimo no less."

Other Tuscan and Umbrian cities, notably Siena and Perugia, took their cue from Florence and developed their own schools of poetry and painting, while owing much to the example of the great Florentines. Botticelli (*d.* 1500), with his freshness and delicacy, is no more typical of his time than Pietro Vanucci "Il Perugino" (*d.* 1523) with his clear, luminous landscapes, far removed from the conventional backgrounds of medieval times, and his still greater pupil, Raphael Santi (1483-1530), who produced a masterpiece every time he laid brush to canvas.

Milan.—In the Visconti of Milan a modern writer sees the most illustrious example of "those nobles who obtained the title of Vicars of the Empire and built an illegal power upon the basis of Imperial right in Lombardy."* Although Gian Galeazzo Visconti's dominions fell to pieces at his death in 1402, his son Filippo Maria succeeded in piecing together the Dukedom. On his death, in 1447, the famous condottiere, Francesco Sforza (who was married to Bianca, the illegitimate daughter of Filippo Maria), seized Milan and established there a good and strong government. He was a capable and enlightened ruler, and something of a statesman. It was Sforza who engineered the Peace of Lodi (with Venice) in 1454, and so contributed greatly to the peace of Italy. Like his contemporaries, he was intensely interested in art, music and literature, and he built the great Sforza castle which stands grimly in the centre of Milan today to remind posterity of his strength and efficiency.

Rome.—In the Middle Ages Rome was in an anomalous position; the ancient centre of the world and the seat of the Papacy, yet in Italy she was merely one among a number of city-states, and not necessarily the most important.

When Aeneas Sylvius Piccolomini, already famous as stylist and scholar, was elected Pope as Pius II in 1458, he determined to make Rome the centre of the Renaissance. In this he was imitating a predecessor, Nicholas V (1447-1455), who had summoned to Rome the best artists and scholars of the day and had built up a great library. His biographer says of Nicholas, "he used to say there were two things he would do, if he had money to spend, that is to say, buy books and build houses. During his pontificate he did both. . . . All men of letters are under heavy obligation to Pope Nicholas for the favour he extended to them, and for the high estimation he gained for books and writers everywhere."*

In his own city the Pope was less a sovereign than he was abroad, or in any other part of the Papal states (which included the Romagna, Umbria, Bologna, Ferrara and the March of Ancona). The Roman Republic was still governed nominally by a Prefect and the Senate. Actually, power was in the hands of the fickle and undisciplined Roman mob; perhaps the population of Rome was the most ignorant and uncivilized in Italy. In circumstances such as these there was little hope of ever securing a united Italy, at least under the leadership of Rome.

Venice.—The Renaissance came later to Venice than to other Italian states, for she was less susceptible to the influence of her neighbours, on account of her isolated position and self-contained policy. In the fifteenth century she was occupied with the attempt to advance as a mainland power at the expense of Milan. She was wise enough to allow her subject states a measure of self-government, and in this Venice was unique, as she was also in the strength and impartiality of her justice. For this reason her colonies and dependencies seldom revolted, and if she had seized her opportunities Venice might well have become the chief power in North Italy.

Venice was essentially a commercial power; trade was the foundation of her greatness, and she carried commercial principles into the conduct of all her affairs. If a servant of the Republic was successful, he might be rewarded; if he made a mistake or was unfortunate, swift retribution would follow. This attitude is illustrated by the execution of the condottiere Carmagnola in 1432. The Venetian government was secret, ruthless and terribly efficient in its methods, which were in striking contrast to those of Florence.

With the discovery of new trade routes, Venetian commerce began to decline, and this, combined with the activities of the League of Cambrai, had, by 1509, reduced

* Symonds *Renaissance in Italy*, vol. i. p. 97.

* *The Vespasian Memoirs.* Trans. Waters, pp. 37-38.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

her once marvellous prosperity in a marked degree.

When at last Renaissance culture reached Venice, it was of a different quality. Abstract scholarship meant less to Venetians than to Florentines; no Platonic Academy was founded in Venice, to whose citizens the Renaissance meant beauty of line and colour and form: the gorgeous and voluptuous rather than the spiritual. The decorative patterns of Crivelli, the lovely calmness of Bellini's Madonnas, the strength and grandeur of Titian—all these are typically Venetian.

The Theory of Sovereignty.—When the despots acquired their position in the communes, their first thought, naturally, was for their own safety. They had every reason to distrust the city militia, which was, in fact, the chief obstacle to their rule. Instead they employed the condottieri, who could be dismissed in time of peace, and who could be relied on to fight "politely" according to definite rules. Bloodshed was rare; the mercenaries won their battles by outmanœuvring or outmarching their opponents, and their artificial warfare soon became a burlesque. That Italian condottieri were successful only against Italians—who kept the rules of the game—was made abundantly clear when foreign troops invaded the country in 1494.

The man who saw most clearly the evils of this system was Niccolo Machiavelli (*d.* 1527), who complained that the condottieri "used every means to spare themselves and the soldiers any hardship or fear by not killing each other in their encounters, but taking prisoners without a blow . . . to avoid trouble and danger." These words were written in his treatise, *The Prince*,* which he dedicated to Lorenzo de Medici. Machiavelli, like the historians Commines and Guicciardini, his contemporaries, tried to interpret the logical meaning of the time in which he lived, and to make a serious study of the problems of political science. To him, failure was the one unpardonable sin, and this view, together with his approbation of craftiness in a ruler, has led to a general misunderstanding on the part of posterity.

Probably no writer has been so often and persistently misrepresented and misquoted as Machiavelli. He was the apostle of the "new monarchy" which was one of the phenomena of his own age. "Calculation, courage, fit means for resolute ends, human force, only these can rebuild a world in ruins."† This was Machiavelli's creed, and these were the qualities of the typical Renaissance prince. Cesare Borgia, son of Pope Alexander VI (1492-1503), was Machiavelli's chosen type. This young prince carved out a principality for himself, and might even have succeeded in uniting central Italy, but for his sudden death. He was "close, solitary, secret and quick;" his revenge on those who had failed or betrayed him, swift and terrible. He was only thirty-one years old when he died.

Other exponents of the "New Monarchy" whose names immediately suggest themselves are Ferdinand the Catholic of Spain (1479-1516), the wily Louis XI of France (1461-1483), and in the next century, most typical of all, Henry VIII of England (1509-1547). Of all these it might have been said, as of Machiavelli's "Prince": "It would be well if he could be loved and feared; but if circumstances force a choice, then it is better to be feared." Of the darker types, sinister and cruel, yet personally gifted and charming, it must suffice to quote—in addition to Cesare himself—Sigismondo Malatesta of Rimini, in whom all the virtues and the vices of the Renaissance Prince are seen in startling juxtaposition.

XXXIX

THE REVIVAL OF LEARNING

The Early Humanists.—Michelet once said that the Sibyl of the Renaissance kept offering her books in vain to feudal Europe.* It was not until the late fourteenth and early fifteenth centuries—the period of transition from the medieval to the modern world—that the time began to ripen. Then there came a great wave of enthusiasm for antiquity and for study of the Greek and Latin classics.

The scholar Poggio searched all the convent libraries he could in Germany and Italy and brought to light many lost and forgotten manuscripts, including the text of Quintilian's *Institutions*. Great libraries were formed, notably by the Medici, by the Renaissance Popes (see Chapter XXXVIII) and by Duke Federigo da Montefeltro at Urbino. Federigo collected a magnificent library; "he spared neither cost nor labour," and spent 30,000 ducats on his manuscripts, all of which were sumptuously bound in crimson and silver. "Manuscripts were worshipped by these men, just as the reliques of the Holy Land had been adored by their great-grandfathers."†

It is often stated, with only partial accuracy, that the Renaissance movement was stimulated by, and the revived interest in Greek literature due to, the flight of Greek scholars from Byzantium when the Turks captured that city in 1453. Interest in Greek was far older than this. Boccaccio

* Trans. L. Ricci.
† Morley: *Machiavelli*, p. 27.

* Symonds: *Renaissance in Italy*, vol. i, p. 8.
† *Ibid.*, p. 16.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*d.* 1375) spent his declining years in studying the language, and the Greeks Chrysolaras and Argyropoulos were staying in Italy as honoured guests and revered teachers some years before the Greek Empire fell. No doubt the scholars fleeing before the Turks did in many cases take refuge in Italy and support themselves by teaching and lecturing, and this would tend to widen the interest taken in Greek studies, but they were supplying, not creating, the demand.

Poggio Bracciolini (*d.* 1459) and Lorenzo Valla (*d.* 1457) represent the earlier stages of Renaissance scholarship, which reached its full height with Angelo Poliziano, Filelfo and Marsilio Ficino. Valla was daring enough to criticize the Apostles' Creed, and he it was who exposed the forgery of the alleged "Donation of Constantine" on which many of the more extravagant Papal claims had been based. All these scholars, it may be noticed, were either Florentines by birth, or spent a great part of their active life in that city under the patronage of Cosimo de Medici and his son Lorenzo "Il Magnifico."

Education.—In no sphere are the new ideas of the period more clearly shown than in that of education. Gone for ever are the arid scholastic arguments, and the university courses of "Trivium" and "Quadrivium" are laid aside in favour of humanistic study. At first all the universities were strongly opposed to the "new learning" and formed against it a united front, but they were gradually forced to open their doors to it. One of the earliest to show a comparatively favourable attitude was the University of Padua, and hither students of all nations flocked to hear the lectures of the great humanist Guarino da Verona (*d.* 1460). When the University of Ferrara, too, was founded in 1436, Guarino was made Professor of Rhetoric.

Guarino's son, Battista, compared his father's pupils to the Trojan horse of Homer, for "as from the Trojan horse of old the Greek heroes spread over the captured city, so from that famous academy of my father has proceeded the greater number of those scholars who have carried learning not merely throughout Italy, but far beyond her borders."*

Most famous of all Renaissance schoolmasters was Vittorino da Feltre (*d.* 1446), who entered the service of the Gonzaga family at Mantua in 1423 and stayed there until his death, as tutor to the young princes. Gian Francesco Gonzaga and his charming wife made much of Vittorino and allowed him a free hand in educating their children and in choosing their companions. Vittorino formed a school of carefully chosen boys, not necessarily of noble birth, although he said that in his opinion thoroughbred colts were best worth training. The fees paid by the wealthy covered the necessities of poor but promising scholars, and Vittorino made no distinctions between them. All his pupils loved him.

Vittorino would not develop the minds of his pupils at the expense of their bodies; he made them take exercise, forbade lounging and supervised their diet. He trained them in athletics, riding, wrestling, swimming, tennis and archery. He taught them to suffer hardship, he insisted on neatness and cleanliness and forbade the use of scent and discouraged foppery in dress. He taught his boys to dance and sing and educated them in all social graces.

Study of each boy's natural talents showed Vittorino his capacities, and he encouraged his pupils to study those things in which they most delighted, instead of forcing the boys' minds into the conventional moulds. He brought Greek masters to the school so that the boys should learn the language accurately, and he gave them all a thorough training in the classics and history as well as in mathematics and music. He was a firm disciplinarian, but seldom found it necessary to punish his pupils, unlike medieval schoolmasters, who believed flogging the only means of fixing Latin grammar in their pupils' minds.

Girls were not entirely omitted from the humanistic scheme of education; indeed, they were permitted to study the classics and history, and some achieved fame in scholarship, but they were not expected to take too deep an interest in mathematics and astrology, nor must they fail to respect the conventions. Little Cecilia Gonzaga, who was learning Greek grammar at the age of seven, was quite the equal of her brothers, and two of Guarino's most promising pupils were young girls, but humanistic education was by no means general among Renaissance women. Most of the wives and daughters even of leading families were still preoccupied with household and domestic questions, although many of them were strikingly intelligent. It is told that the daughter of Louis XII of France knew history, mathematics, Latin and Greek as well as any learned man of her time. Lady Jane Grey of England was also a Greek scholar.

The Art of Printing.—In his celebrated description of the library at Urbino, Vespasiano writes: "Had there been one printed book, it would have been ashamed in such company." Vespasiano da Bisticci (*d.* 1498) was an old man, and from his shop in Florence had come many of the most beautiful and artistic manuscripts the world has ever seen. He was "a prince among

* Trans. Woodward, *Vittorino da Feltre and other Humanist Educators*, p. 18.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

booksellers," and it is not surprising to find that he resented and hated and despised the art of printing, then in its infancy.

The use of movable types had been known to the Chinese centuries before, but as Chinese characters are so many and so elaborate, it had never been worth their while to exploit the discovery, and the invention of movable type was made in the West about the middle of the fifteenth century. The wooden blocks cut for printing each page of a "block-book" may have given the idea to the inventor of movable type, but these books were quite different, and the demand for them continued in spite of the new invention.

The earliest known specimen of printing from movable type, probably by John Gutenberg (*d.* 1468), was produced at Mainz in 1454. Two years later Gutenberg finished, with the help of Fust and Schoeffer, the famous 42-line Bible known as the Mazarine Bible. In 1457 Schoeffer produced his Psalter, a beautiful book, and the first book to bear a printed date. Printing was beginning to pay its way, and buyers began to realize the great advantages of printed books over manuscripts. By 1469 Schoeffer was able to issue a catalogue of books for sale, to the number of twenty-one: this was in the form of a single-sheet advertisement to be fixed up in different towns, showing where the books might be bought.

From Germany the art of printing spread to all countries of Europe, and soon Sweynheym and Pannartz were printing at Subiaco, Colard Mansion in Bruges, and William Caxton at Westminster. Later in the century the most elegant of early printers, Jenson, began to print the classics, and then came the greatest of them all—Aldus Manutius at Venice, where he set up his press in 1494. The Aldine editions of both Greek and Latin classics are things of the greatest beauty, and an inestimable boon to scholars.

Apart from the great reduction in price, which commended printed books to buyers, printing made possible an infinitely higher standard of accuracy. Even the most perfect manuscripts abounded in mistakes, and although writers did their best to look over and correct from the "archetype" all the copies of their work they could, it was not humanly possible to avoid occasional error. The far-reaching results of this invention were not immediately appreciated at the time, and men like Vespasiano might scoff, and as late as 1492 the scholar, Trithemius, might write a treatise, "In Praise of Scribes," but the importance of the art of printing cannot be over-estimated in the history of civilization.

The Renaissance North of the Alps — the early days of the Renaissance it was the custom of Italian scholars to despise and mock at the scholarship of the "Ultramontanes" who climbed the Alps and descended into Italy in search of learning. Vespasiano describes a certain German bishop who became absorbed in the volume of Plotinus he was reading, and "he . . . sat over it for three hours without stirring, and never lifted his eyes from the book; not like other ultramontanes, who have as a rule no taste for close study."

Moreover, when an English ambassador to Rome made an elegant Latin speech before Pius II (1458-1464), the Pope burst into tears of joy to think that such eloquence could come from the lips of an Englishman, for England beyond all other countries was believed to be the home of barbarism. The "barbarian" ultramontanes, however, continued to visit Italy in ever-increasing numbers, and to collect manuscripts and take them home to their northern libraries. One English collector bought so many books in Florence that he had to charter a special ship to take them back to England. It is sad to reflect that all save three of these books are now lost.

The art of Renaissance Italy made little general impression upon the northern nations. Here and there an artist, like Dürer, came under its influence, only to develop a style of his own. The great contribution of Germany to the Renaissance movement was the critical spirit which gave to scholarship the quality it had lacked hitherto. The German humanists were preoccupied with Christian rather than pagan philosophy, they were less likely than the Italians to become intoxicated with the beauty of words or style. They supplied wit and satire, and with these were their shafts barbed, rather than winged with elegance.

Chief of all is the great scholar Erasmus of Rotterdam (*d.* 1536). It was the aim of his life to increase the sum of human knowledge; he is often claimed as a reformer, and it is true that he did expose and mock at abuses—for instance, in his satire, *In Praise of Folly*—but he believed that if ignorance and superstition could be dissipated, then reform would come naturally and without violence. His English friends, Colet of St. Paul's and Sir Thomas More, welcomed him when he visited England and tried to put his theories into practice. The greatest work of Erasmus, for which his name will always be famous, is his edition of the New Testament and the Letters of Jerome. He settled in Basle to see the great work through the press (for it was printed there by John Froben) and in 1516 his Greek Testament appeared and made a profound stir in the world of letters.

In France, François Rabelais (*d.* 1553) was sharpening his wits at the expense of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the clergy in his entertaining books describing the adventures of Gargantua (printed at Lyons in 1532) and Pantagruel. "Laughter," he declared, "belongs to man alone," and, to prove his thesis, the books sold at an amazing rate, for all the world enjoys being made to laugh. Rabelais sounded a note of mirth which made a chord with the philosophical utterances of Montaigne (*d.* 1592) and Francis Bacon (*d.* 1626) and the shrewd criticism of Desiderius Erasmus. The Renaissance had been slow to cross the Alps, but by the sixteenth century it had gained more than it had lost by its transference from Italy, where the first impulse had died away.

XL

THE FINE ARTS

In medieval times a strange medley of folk-lore, superstition and elaborate reasoning from abstract premises passed for "science," and took the place of observation and deduction from natural phenomena. Charms or sacred relics were expected to cure all ills and avert all dangers, and it was thought impious to question their efficacy.

The scientific spirit, ready to examine, explore and experiment, was not born with the Renaissance—there had been individual searchers after truth such as Roger Bacon, Abelard and the Emperor Frederick II—but it was at this time that there began to stir a restless curiosity in the minds of men who had hitherto been docile believers in the faiths and theories of their forefathers.

Leonardo da Vinci (1452-1519).—Foremost among these inquirers and seekers after knowledge, and most versatile of all men of his age, was the painter-sculptor-engineer, Leonardo da Vinci, and it is worth while to examine his career in some detail, for in him we find exemplified the most important qualities and tendencies of the Renaissance.

Leonardo has left to posterity an extraordinarily interesting collection of note-books, full of drawings and diagrams and notes on his views and feelings; in addition to his admirable works of art. His intellectual energy and curiosity were inexhaustible, and he seemed born to all that he undertook. At first his interests were divided between music, drawing and modelling, but when he entered the studio of Verrocchio (1470) he concentrated on sculpture and drawing. He believed painting to be superior to sculpture because sculpture needs light and shade while a picture supplies its own. It is less easy in sculpture, he says, to correct a mistake, and he adds, "it is more difficult to correct the mind of the master who makes such mistakes than the work which he has spoiled."*

Leonardo advocated drawing from nature, and disparaged the slavish copying of other men's work, however good, "for he who has access to the fountain does not go to the water-pot."† He believed that the personality of the artist is revealed in his work ". . . if you are brutal, your figures will be the same and devoid of grace, and in like manner every quality that there is within you of good or of evil will be in part revealed in your figures."‡ He himself had little to fear from such revelation, for he was as charming as he was handsome.

When Leonardo was twenty-five years old he began to work for Lorenzo de Medici; in 1482 he left and went to Milan, where he entered the services of Lodovico Sforza, "Il Moro," a great patron of the arts. Here he made plans for the reconstruction of the city on sanitary principles, for irrigation works and waterways in Lombardy, and for improving the defences of the Sforza castle. He made studies for the great statue which he intended to be his masterpiece, but which was never finished—a bronze of Francesco Sforza on horseback.

All this time he was working at intervals on his lovely (but now sadly faded) fresco in the convent church of Sta. Maria delle Grazie at Milan, the famous "Last Supper." He finished, too, the final version of his "Madonna of the Rocks," now in the National Gallery in London. He took only the slightest interest in politics, and called war "bestial frenzy," but he accompanied Cesare Borgia on his expeditions and acted as chief military engineer, designing harbour works, making maps and also planning artillery.

One of the most interesting of all Leonardo's works is his treatise on the "Flight of Birds," in which he discusses problems of flight which have only been taken up seriously within the last decade. He designed a flying-machine which bears a striking resemblance—in principle, if not in detail—to the modern autogiro, and he fully appreciated the importance of air-currents and their influence upon gliding. Anatomy, physiology, optics and the laws of perspective all interested him intensely. He greatly admired antiquity, yet he did not imitate ancient models; he studied, but he did not copy, he breathed new life into every subject he touched.§ "I can do," he wrote to "Il Moro," "everything possible to man."

* *The Notebooks of Leonardo da Vinci*, edited by McCurdy, p. 161

† *Ibid.* p. 178

‡ *Ibid.* p. 101

§ Leonardo was also a musician and a poet; he used to sing "canzoni" of his own composition before Lodovico "Il Moro" accompanying himself upon a silver lute of his own design and workmanship.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Benvenuto Cellini (1500-1572).—Another side of Renaissance life is illustrated by the goldsmith, Benvenuto Cellini. He was a rogue, a liar, a thief, extravagant and brutal—and he was also a consummate artist. He has left posterity a revealing portrait in his *Memoirs*, a delightful yet mendacious book which gives a unique picture of the times and the circle in which he worked. He has left, too, exquisite examples of his art, golden salt-cellars, armour, and the famous bronze Perseus at Florence. Like the Venetian poet, Pietro Aretino (*d.* 1557), "one of the most unprincipled of literary bandits who have ever disgraced humanity,"* Cellini was a ruffian and a swashbuckler, yet at the same time he was a conscientious craftsman. His genuine feeling for beauty led him to work only from the best designs and to use the best materials; he never produced inferior work, nor did he trade upon his reputation.

Cellini indulged his appetites, he brawled, he swaggered, he murdered when the fancy took him, and he has noted his misdeeds with frankness in his autobiography. He had neither the depth nor the universal genius of Leonardo, but in him we find the typical qualities of the Renaissance Italian, and he has left us an unrivalled picture of an artist's life in Rome, Paris and Florence in the early sixteenth century.

Albert Dürer (1471-1528).—A third, and very different, type of artist was the German, Albert Dürer, a native of Nuremberg. He had far more in common with Michelangelo or da Vinci than Cellini, for he shared the former's passionate curiosity and strength of purpose, but he fell far short of da Vinci's universality. He retained much of the spirit of the medieval craftsman, in spite of his veneer of Renaissance culture and his genuine appreciation of his Renaissance friends.

Dürer was trained as a goldsmith, but in 1486 he was apprenticed to a painter in Nuremberg. Three years later he set out to travel in South Germany, and afterwards visited Venice, where he met Bellini. In 1520 he visited the Netherlands. Like Leonardo, Dürer drew from nature and studied landscape for its own sake. He painted portraits, too, and he was a master of the art of engraving. His drawings of plants and animals are unequalled; indeed, his fame as a draughtsman and engraver eclipses his ability as a painter. Dürer's admiration for his Italian masters and his interest in the new movement, combined with the serious "Gothic" qualities of his native land, give him a unique position in the history of Renaissance art. A friend said of him that if he had a fault, "it was his inexhaustible industry."

* Symonds's *Renaissance in Italy*, vol. iii., p. 357.

XLI

THE REFORMATION AND THE COUNTER-REFORMATION

The Renaissance in art and literature is reflected in the history of the Church through the movement known as the Reformation. Inevitably the new spirit, at once critical and creative, produced not only artists and scholars but men of religion who attacked the obvious faults of the Church and men who claimed inspiration and divine guidance outside the Church. The Reformation began with the attempt to purify the Church from within, and ended by destroying the unity of Christendom.

For convenience the Protestant Reformation may be said to begin in 1517, when Martin Luther nailed his ninety-five theses to the door of the church in Wittenberg. He publicly burned the Papal Bull containing his excommunication in 1520, and defied the Emperor Charles V in 1521 at the Diet of Worms. But Martin Luther was only one of a long line of reformers who were shocked by the abuses of the Church, who dared to put their individual conscience and judgment before Papal authority and who sought in the New Testament and in the life of Christ and His apostles authority and example older and nobler than those of the Church of their own time.

The Early Reformers. — In the fourteenth century the most orthodox churchmen had much to criticize. The Papacy was in exile in France, and rival Popes issued bulls in the name of St. Peter.

In England Wycliffe had national opinion behind him when he maintained that papal dues should not be paid until the schism in the Papacy was healed, and while the Father of the Holy Catholic Church lived in Avignon. Wycliffe translated the Bible into English that it might be read and understood by the unlearned. In spite of heretical doctrines he alone of the early reformers died a natural death.

Early in the fifteenth century the Conciliar Movement was inaugurated in an attempt to reform the Church from within. Councils of the Church were called together (the first was held at Constance) to end schism, condemn heresy and reform the Church.

The heresies of Wycliffe had gone unpunished, but John Huss, a religious leader in Bohemia, was summoned before the Council of Constance in 1415 to answer for his opinions. He commanded a great deal of popular support in advocating the use of the Czech language in Church services, and a Czech Bible for the people was passionately desired. John Huss went fearlessly to the Council, and as fearlessly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

maintained his opinions there. The safe-conduct granted him by the Emperor Sigismund was disregarded, and in 1415 he was condemned to be burnt alive, and his ashes were scattered lest his remains should be recovered and venerated.

How little the Councils of the fifteenth century did to reform the Church may be measured by the denunciations of Savonarola (*d.* 1498) at the end of the century. He was no heretic, but was shocked by the worldliness of the Church, and of the Pope himself, no less than by the sins of the people of Florence. Although for a time he swayed the populace by the power of his eloquence, he failed to make any lasting impression on his contemporaries, and his attack on the corruption of the Church was punished by imprisonment, torture and death.

When, early in the sixteenth century, Martin Luther defied Pope and Emperor, many were reminded of the fate of John Huss and begged Luther not to appear at the Diet of Worms. After he had been condemned and outlawed by the Diet, the Elector of Saxony, taking no risks, hid him in his own castle, where Luther worked at the translation of the Bible into German. Many of the German princes declared for Luther against the Emperor, while others supported Catholicism and the old order against heretics and rebels. Thus the unity of Germany and the unity of the Church had been destroyed.

The Reformation in England.—In England, Henry VIII (1509-1547) professed himself profoundly shocked at the heresy of Germany and wrote a pamphlet attacking Luther and calling him a "scabbed sheep." This earned him Papal approval and the title of "Defender of the Faith." Yet, some ten years later, Henry himself cast off Papal authority and launched the English Reformation. There was nothing of the spirit of Wycliffe, John Huss or Savonarola behind this quarrel with Rome. Henry wanted a male heir to the English throne, and had therefore determined to divorce his Queen and marry Anne Boleyn. Because the Pope would not sanction this, Henry VIII declared himself Supreme Head of the English Church, and sanctioned his own marriage to Anne Boleyn before the birth of her child. To his great chagrin the child was a daughter.

Henry's heir, Edward, the child of Jane Seymour, was not born for a year or so after Anne Boleyn had been executed. He was still a child when his father died, and his advisers were Protestants. It was in this reign that the Protestant Reformation in England was really accomplished; the first English Prayer Book was issued, and an English Bible chained in the churches. There were, however, peasant revolts in the west country, where popular feeling was hostile to the unfamiliar English service.

Edward died in 1553, when still a boy. His elder sister Mary, the daughter of the divorced Queen Catherine, half Spanish and wholly Catholic, succeeded him, and she determined to undo all that had been done.

The Counter-Reformation and the Jesuits.—It was less than forty years since Luther had launched the Protestant Reformation, but in that time the Catholic Church had at last been reformed. Ignatius Loyola (*d.* 1556) had formed the Society of Jesus (the Jesuits), soldiers of Christ, who were ready to live and die for the Catholic Church. The Council of Trent had met in 1545 and "defined the faith and limited the faithful." Abuses had been remedied, sincerity and zeal were no longer lacking. This movement within the Church is known as the Counter-Reformation. The history of the sixteenth century is the history of the struggle between the two opposing forces of Reformation and Counter-Reformation, between the old order and the new.

Thus Queen Mary had power behind her in her attempt to restore in England the authority of the Pope and the services and faith of Rome. She married the Most Catholic King Philip II of Spain, the arch-champion of the Counter-Reformation, and immediately aroused against herself the growing national feeling of England. A people who had disliked the recent changes disliked not less the presence of Spanish Jesuit priests in England and a Spanish King Consort.

Philip II of Spain (1558-1598).—Philip of Spain's whole life was spent in combating the combined forces of Protestantism and nationalism. His loveless political marriage with Mary Tudor and his appearance in English politics form but an incident in his laborious struggle for Catholicism. He was by inheritance King of all the Spains in the Old World and in the New, Lord of the Netherlands and Archduke of Austria.

Heresy in Spain he did combat successfully with all the grim power of the Inquisition. Heretics were burnt alive, maimed by "the thumbscrew and the rack and the villainies of Spain." Even recantation could not save a Spanish heretic. He too was burnt alive, but he could hope that the eternal flames might at last be quenched and his soul saved.

But victory for Philip and the leaders of the Counter-Reformation would mean no less than the restoration of the whole of Europe to the Catholic Faith, and national, no less than religious, feeling made this impossible.

Before his accession, half Germany was already lost to Catholicism, for Germany had won from his father, the Emperor

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Charles V, the religious Peace of Augsburg in 1555, which allowed each Prince or city-state to decide their religion for themselves.

The Netherlands resisted the worst that the Inquisition could do, and from 1566 were in a state of revolt. From 1572, with the advent of the dauntless "sea-beggars" into the struggle, Spain was fighting a losing battle. The Dutchmen were ready to flood their land with the sea rather than surrender.* In 1579 William the Silent brought about the union of the seven Northern Dutch Provinces (modern Holland), and continued to fight for independence, though the ten Southern Provinces (modern Belgium) capitulated to Spain and the Papacy.

Failure of the Counter-Reformation.—Long before this, in 1559, the Counter-Reformation had failed in England. Mary died childless and left Anne Boleyn's daughter, Elizabeth, heir to the throne. With the accession of Elizabeth, England definitely ranged herself against Spain and so against Catholicism. For long years Philip II laboured to prepare a fleet, or armada, which should destroy the power of England, depose Elizabeth and make safe his empire in the New World. In 1588 the long-expected armada met the English fleet in the Channel and utterly failed in its purpose. Only a shattered remnant of the great ships found their way back to Spain.

In Ireland the reformed religion had been established, but the ceaseless work of the Jesuits after 1570 reconverted the people to a passionate adherence to Rome which no persecution could shake.

Scotland, on the other hand, was as passionately Calvinist. John Knox (*d.* 1572) spent some years in Geneva and returned to evangelize his own country. Only in the wildest parts of the Highlands did his influence fail, and there Catholicism may be found today.

The Huguenots in France.—No country in Western Europe escaped the upheavals of the Reformation and Counter-Reformation. In France, the Reformation resulted in civil wars between a minority of Protestants (Huguenots) and the Catholics. The Huguenots were disciples of Calvin (*d.* 1564), the Frenchman who made Geneva a Protestant city.

The Government of France was powerless to suppress, and unwilling to accept, the reformed faith. The Massacre of St. Bartholomew (1572) was an attempt to get rid of all Huguenots at a blow, and Coligny, Admiral of France, perhaps the finest of them all, was murdered. The civil wars dragged on until Henry of Navarre, a Huguenot, succeeded to the French throne. The French defended Paris against him, and it was clear that France as a whole was determined to be Catholic. King Henry IV, in order to enter his capital, surrendered his religion. "Paris is worth a Mass" was his explanation and defence.

In 1598 the Edict of Nantes gave toleration to the Huguenots, and the reign of Henry IV (1594-1610) brought peace and unity to France.

The Thirty Years' War, 1618-1648.—At the end of the sixteenth century there was a pause in the fierce struggle between Catholic and Protestant. In 1598 Philip II died, France was at peace, England was united and triumphant under the rule of Elizabeth. But religious wars were still to come, and in 1618 the Thirty Years' War broke out in Germany.

There, religious peace had endured since the Peace of Augsburg in 1555, but recognition had not been given to Calvinists, and since the Catholic revival German Protestants had grown increasingly to fear reaction and the missionary influence of the Jesuits.

The inevitable conflagration began in Bohemia. The Bohemians, after nineteen years of civil war following the burning of Huss in 1415, had submitted to Catholicism, only to declare for Lutheranism a century later. In 1618 the Bohemians elected a Lutheran German Prince for their king to defend the cause of Protestantism for them under the terms of the Peace of Augsburg. "Only a winter king," said the Jesuits of the new monarch of Bohemia, and indeed the combined forces of the Holy Roman Emperor, of Maximilian of Bavaria and of the King of Spain proved too strong for him. Bohemia was overrun by the troops of the Catholic League under Tilly, and the king was an exile. Not only were the Protestants of Bohemia in danger but also the cause of Protestantism in Europe. Salvation was to come from the north, for Denmark, Norway and Sweden had become Lutheran.

The first of the Scandinavian countries to interfere in the Thirty Years' War was Denmark. But the Danish armies, disappointed of promised English subsidies, were defeated and Denmark was invaded. King Christian IV of Denmark (1588-1648) made peace in 1629, and in the same year Gustavus Adolphus of Sweden (1594-1632) declared war. He dreamed of forming a mighty Protestant Empire in the north to balance the Catholic League of the south. In 1631 the Catholic forces were shattered by Gustavus, the "Lion of the North," and again in 1632 the Swedes were victorious at Lutzen, defeating the new army raised by Wallenstein. But at Lutzen Gustavus Adolphus was killed. His death ended the dream of a Protestant Empire, but it is scarcely too much to say that his heroic intervention at

* See Chapter XLIX.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the darkest hour saved Protestantism on the Continent of Europe.

When peace at last was made in 1648, the religious Peace of Augsburg was ratified, and extended to include Calvinists; and Sweden was compensated for her share in the war.

The Religious Settlement. — After the Peace of Westphalia (1648) the religious wars that had convulsed Europe for two centuries were virtually over. Europe had lost her unity, and independent states and nations had vindicated their right to a separate existence. Speaking generally, it may be said that Northern Europe became Protestant and Southern Europe (including Bohemia) remained Catholic. Poland and Ireland were both outposts of Catholicism in the north, whose reconversion was due to the zeal and courage of Jesuit missionaries. Switzerland, home of Zwingli and Calvin, was a Protestant stronghold in the south.

Inevitably, in all countries there were many individuals whose religious convictions were not those of their rulers, and these suffered persecution or disturbed the peace for many years to come, for the idea of religious toleration belongs to a later age. The principle *cuius regio eius religio* was the nearest approach to religious freedom.

In France the Protestant Huguenots suffered. Louis XIV (1643-1715), persuaded by Madame de Maintenon, influenced in her turn by the Jesuits, revoked the Edict of Nantes in 1685.

In England Catholics hoped to uproot the Protestant succession, and suffered under severe penal laws in the reign of Elizabeth and throughout the seventeenth century.

The last attack of the Counter-Reformation in England is bound up with the Stuart cause, and belongs as much to the constitutional history of England as to the history of the Reformation and the Counter-Reformation. After the execution of Charles I, his children grew up in France as Catholics. James II lost his throne in the attempt to restore Catholicism, and the Catholic and Stuart cause dwindled in England to spasmodic rebellion.

The religious map of Europe had indeed been made by the middle of the seventeenth century, and the religions of countries could no longer be changed. In the eighteenth and nineteenth centuries trade, and not religion, set the nations at enmity, and political rather than religious creeds produced revolution.

XLII

THE EARLY DISCOVERIES

Geographical Science in Medieval Times.—Even today there are people who maintain that the earth is flat, and in the Middle Ages it would have been impious even to suggest that this was not the case. Cosmas, the sixth-century Greek who wrote an account of his wanderings known as the *Christian Topography*, was convinced that the earth was perfectly flat and that the four walls which composed the sky met overhead in the dome of Heaven.

It had been proved that it was possible to sail beyond the Pillars of Hercules (or Straits of Gibraltar) and the Northmen had boldly sailed their undecked ships many hundreds of miles into unknown seas. There was, nevertheless, great timidity and fear of the unknown in the minds of most medieval travellers, and they preferred to keep closely to well-known routes lest they might come upon monsters of land and sea, or, worse still, reach the world's end.

Throughout the Middle Ages, geographical science was based on Ptolemy's atlas (A.D. 159). Many of his ideas were remarkably sound, and he was the earliest map-maker to realize that the Caspian is an inland sea. He mapped the Near East correctly, but his ideas of India and China and Africa were wrong, for he made Africa run along the southern edge of his map, and up to join China, thus making the Indian Ocean an inland sea.

Medieval cartographers not only repeated Ptolemy's errors; they inserted other and stranger ones of their own. Some of the maps were square, others round, and outlying islands, such as Britain, had to be squeezed and altered so as to fit the shape of the map. Jerusalem, the centre of the Christian Faith as Mecca was to the Moslems, was often taken as the centre of the world, and many of these "round" maps—though charmingly decorative and full of interesting detail, are horribly distorted.

The Arab geographers (see Chapter XXIV) were, up to the fourteenth century, far in advance of the Christians, and it was probably from Arab sailors that Europeans learned the use of a compass card. The use of the compass had been known to scientists in the thirteenth century, Roger Bacon for one, but only in the guise of a magnetized needle floating on a straw. By the beginning of the next century, however, the mariner's compass was coming into general use, at any rate in Mediterranean shipping. This meant a great advance in the science of navigation, for hitherto sailors had been obliged to keep close inshore when neither sun nor stars were visible to give them direction.

Of much more practical use than the elaborate maps, often drawn by monks who had never travelled beyond their convent walls, were the "portolani," or coast-maps made by sailors and merchant traders for their own guidance. These showed, not where unicorns might be found, but the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

location of shoals and rocks and sheltered harbours, of bays, headlands and mouths of rivers. The portolani, of which the most famous surviving example is the Laurentian Portolano of 1351, now at Florence, give a remarkably accurate outline of the world as known at that time. They were, however, despised by scholars, who preferred their own fantastic guesses. One of these wildly imaginative maps was executed as late as 1450; it is known as the Borgian Map, and may be found in the British Museum. The portolani concerned themselves only with the coast-line; they were not meant to be more than mariners' charts, and this purpose they admirably fulfilled.

Early Explorers.—The discoveries of the Northmen have been noticed elsewhere (see Chapter XXVI), but, as it seems their explorations were never followed up, men forgot anything they might have heard about "Vineland the Good," or compared it with the legendary St. Brendan's Isle off the north-western coast of Ireland.

In Asia the Friars John Carpini (1245) and William of Rubruck (1252) had made their way across the Persian desert into the dominion of the Great Khan, and the Polo brothers had even reached Peking (see Chapter XXXIV). Another Friar, Odoric of Pordenone, has left an amusing and valuable account of his travels in Tibet and China, undertaken between 1316 and 1330. Wars and revolutions cut short communication between East and West by this channel; the risks were too great for traders to make their way overland, and new routes would have to be found if regular communication was to be resumed. To clinch the matter, the Ottoman Turks had possession of Asia Minor and in 1453 captured Byzantium, where most merchants had their Eastern European depots.

The Moslems had named the Atlantic "the Green Sea of Darkness," and had a horror of venturing far out upon its waters, but they had crept round the coast of the Sahara down to the Senegal River to the country they called "Bilad Ghana" (Land of Wealth). The Genoese, and afterwards the Portuguese, determined that they would push on farther down the coast until they should round the southern point of Africa, and then sail due east for the Indies.

There were many difficulties to be overcome, beyond the superstitious terror which made men afraid of the horrible monsters they might see, and the dangers they might meet. It was said that a white man passing Cape Bojador would immediately turn black, and that there was a magnetic mountain in the Indian Ocean which would draw the nails out of passing ships and cause them to fall to pieces and founder. Medieval ships, too, were clumsy and unseaworthy. They were often undecked, or protected only by tarpaulins, and were nearly round in shape, so that they rolled distressingly in any swell. Most of them were single-masted and carried a large square sail. The sail area could be increased in fair weather by lacing on extra "bonnets" of canvas.

In the fifteenth century modifications in design and rigging greatly improved shipping, enabling vessels to sail several points closer to the wind, and this had an important effect upon the voyages of the early explorers. The seamen developed a more adventurous spirit and began to sail a bolder course, instead of creeping timorously close inshore. Both these developments owed much to the genius of one man, whose life work it was to inspire and equip seamen to explore those coasts he was never able to visit himself. This was "Prince Henry the Navigator," morally the discoverer of the eastward route to the Indies, the genius of the Portuguese explorers, and the unconscious father of the slave trade.

XLIII

THE EASTERN ROUTE TO THE INDIES

Prince Henry the Navigator (*d.* 1460).—On Cape Sagres, a lonely headland on the south-western extremity of Portugal, Prince Henry built for himself a palace, a chapel and an observatory. He was the third son of the King of Portugal and grandson of the English John of Gaunt, but he cared nothing for court life and little for military glory; his whole heart was in exploration and discovery. He collected charts and maps and books on geography, and he caused a new type of vessel, the "caravel," to be built in the shipyards of Lagos, the port in Algarve, close by.

Prince Henry sent out various expeditions with orders to round Africa and sail due east for the Indies, not realizing the enormous extent of the "dark continent." When his men reached the Guinea Coast they landed and collected as curiosities some handfuls of gold-dust and several natives (1442). The exhibition of these trophies in Lagos led to far-reaching results, for recruits for the expeditions were no longer slow in coming forward, and dealers saw the opportunity of buying or stealing further supplies of natives for slaves.

To the credit of Prince Henry it must be said that he did not look upon the slave trade he had initiated as a means of making money; his one thought was to convert the natives to Christianity. But others were less scrupulous, and soon a flourishing trade was established. In the next century, when it was found that slave-labour would be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

needed to develop the West Indies, the unfortunate West Africans were shipped across the Atlantic—often with almost incredible cruelty—and so began the American slave trade.

In the year 1445 twenty-six vessels reached the Senegal River, which they believed to be the "western Nile," and the following year an expedition brought back from the same region elephant tusks and a live lion as a present for Prince Henry. One of his captains, Cadamosto, wrote a description of a voyage, completed in 1456, which extended past Cape Verde to the Gambia River. Cadamosto had heard of the riches and wonders of Africa, "the which did exceedingly stir my soul," he said, "eager as it was for gain above all things else," and it was in this spirit that many of Prince Henry's seamen signed on for a voyage.

Prince Henry died in 1460, before he could reap the reward of his labours. For some years after his death the enterprise languished, and slave hunting proved more attractive than exploring the long coast, but in 1484 Diego Cam reached the mouth of the Congo River and sailed up it a distance of four miles. Three years later Prince Henry's vision was fulfilled.

Diaz rounds the Cape, 1487.—In the year 1486 an expedition under the leadership of Bartholomew Diaz sailed on past the Congo, past the Orange River, running before incessant storms out into a cold, unfriendly sea. Then the ships were blown back towards the coast, and steering north they struck land and followed the coast north-east as far as Algoa Bay and the Great Fish River. Diaz had passed the Cape without realizing he had done so; it was not until the return voyage that he saw the great headland and named it the Cape of Storms. On his return to Portugal, it was renamed the Cape of Good Hope. Diaz was greeted with enthusiasm, for all Europe was excited by the discovery. The humanist Poliziano wrote a complimentary letter, in his best style, to the King of Portugal.

Vasco da Gama and his Voyage to India, 1497-1499. — The eastern coast of Africa was well known to Arab traders as far south as Mombasa, and now only a comparatively short strip of coastline divided the trade routes of east and west. The first explorer to make the voyage from Europe to India was, like Diaz, a Portuguese, and his name was Vasco da Gama.

Careful preparations were made for the voyage, and his four ships were splendidly equipped with books and charts and food supplies and merchandise thought suitable for trade with the Indians. The expedition set out from Lisbon, with ceremony and pomp, and made a good voyage round the Cape and up to Mombasa, and thence across the Indian Ocean to Calicut. The voyage lasted just eleven months, and the return was equally successful. Vasco da Gama was well rewarded for his venture, and rightly so, for he had laid the foundation of the Portuguese dominion in the East. His voyage was the logical conclusion and fulfilment of Prince Henry's schemes, and at last a new route to Cathay had been found.

The Portuguese Empire in the East.—Vasco da Gama had traded successfully with the natives at Calicut, bringing home a cargo of spices and rubies, and he had acquired valuable information about the coasts of India, Ceylon, Malacca and Sumatra. But his Moslem rivals, incensed at the idea of Portuguese competition, had intrigued with the natives, and at one point he and his men had barely escaped assassination. It was clear that some stronghold would have to be established, and an armed force to protect Portuguese interests.

The Portuguese captured Cochin and Cannanore, and determined to dislodge the Arabs from Calicut and to establish a new trading station on the Malabar coast. There was some idea, too, of seizing the Arabian ports of Hormuz and Aden and so to gain control of the Red Sea. In 1510 Goa was captured; this became the centre of Portuguese domination and a thriving port. The following year, 1511, Malacca was seized by Albuquerque, who between 1509 and 1515 built up an eastern empire for Portugal.

Albuquerque had practically cleared the Indian Ocean of Turkish and Arab ships; it was his plan to dominate the Red Sea also. He wanted to capture Jerusalem, and he had an idea of establishing himself also on the Upper Nile and cutting a canal through the mountains to divert the river into the Red Sea. He failed to capture Aden in 1513, and this prevented him from carrying out his more ambitious schemes, but he did gain possession of Hormuz and set up a factory (or trading station) there.

The Portuguese now (1515) controlled the eastern trade routes, and soon acquired control of the whole eastern trade. Overland, the route lay from India to Persia, through Mesopotamia to Aleppo and thence to Beyrut on the Mediterranean coast, but it was quicker and easier to ship goods to Hormuz, and in practice most merchandise was sent to Europe this way.

Albuquerque was typical of his time in his forcefulness and efficiency, blended with some brutality and a strong streak of piety. When he captured Malacca it is typical of the man, and what he represented, that his first actions were to build a fortress, a mint and a church dedicated to the Virgin.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

XLIV

THE NEW WORLD

The Discovery of America.—Many years before the famous voyage of Columbus resulted in the discovery of a new continent, Roger Bacon had argued in favour of sailing west to reach the east, and there was a legend of a great continent named "Atlantis," lying to the west, beyond the Azores.

Christopher Columbus, who, like most serious thinkers of his day, was convinced of the roundness of the earth, believed it to be not only possible but practicable to reach the east by sailing west. He was anxious to reach "Cathay" and "Cipangu" (Japan), and he began to think that, if men could sail so far south, one might also sail west and find lands in that quarter.* For years he vainly tried to persuade various rulers to fit out an expedition for him, but it was not until 1492 that he induced Ferdinand the Catholic, King of Spain, to send him on a commission to discover a new route to Cathay. Columbus was obsessed with the idea of the riches and glories of Cathay, for he had been reading Marco Polo's book of travels.

Columbus set sail with an unsatisfactory and unwilling crew, who became openly mutinous when many days passed and no land was seen. At last, when Columbus was almost in despair, and his men were threatening to put about and run for home, land was sighted. It proved to be an island, actually one of the Bahamas, but Columbus thought it was off the coast of Cipangu and landed there with joy, expecting to pick up quantities of treasure. In this he was disappointed, but he voyaged about the archipelago and gained a general knowledge of the islands before returning to Spain in triumph early in 1493.

The news made a great impression, not only in Spain but in all Europe, and further expeditions were at once organized. When, however, Columbus returned empty-handed, the king's disappointment was great, and a reaction set in against the explorer and he no longer found favour at court. He made five voyages in all, and brought back strange plants and gaily coloured parrots, but no silks or spices. From one voyage to the west, Columbus was even sent home in chains, though he was afterwards released, and, great discoverer that he was, he died a disappointed, discredited and broken-hearted man.

The Naming of America. — Columbus never realized that he was still far from Cathay; the magnitude of his discovery never dawned upon him. It was left for a Florentine pilot, Amerigo Vespucci, to give his name to the new continent, although he only followed where Columbus had shown the way, and the name was given in 1507 through the ignorance of an obscure printer in Lorraine, who had read Amerigo's account of his voyage.

The most important results of the discovery that the islands Columbus had found were close to a new vast continent of unknown extent, were first to establish that the world was much larger than had been supposed and secondly to shift the centre of the known world farther west. This particularly affected the British Isles, which no longer lay on the fringe of civilization, but in an excellent strategic position for taking up commerce with the newly found country.

Magellan's Voyage round the World, 1519-1522.—Like Vasco da Gama, Magellan was a Portuguese, but he could not induce the King of Portugal to finance his expedition. Magellan was determined to prove indisputably the roundness of the world by sailing round the new continent and beyond until he should reach the Indies, and so round Africa back to Europe; that is, to circumnavigate the world from west to east.

In 1519 he was commissioned by the King of Spain to make his voyage, and set out across the Atlantic. Brazil had been discovered by the Portuguese Cabral in 1500, and part of the coast of South America had been explored, but no one had any idea how far south the continent ran. Magellan was a firm disciplinarian, and ordered his men to "follow the flagship and ask no questions." Even so, he was obliged to land in Patagonia and hang some of his men for mutiny. Magellan found the strait which bears his name and made a slow progress through it, taking soundings all the way, and at last reached the Pacific Ocean.

Stores were running very low, and by the time the Ladrone Islands were reached the crews were in a desperate plight and reduced to eating rats and sawdust. They had voyaged for eighty-nine days without sighting any land except two small desert islands. From the Ladrones they proceeded to the Philippine Islands. Here tragedy befell, for a quarrel with the natives led to a fight in which Magellan and a number of his men were killed. The survivors fled and made the best of their way home. Five ships, with 280 men, had left Seville in 1519; only one returned, with eighteen men of the original expedition. So ended this famous voyage.

Spain in the New World.—As soon as Columbus's discovery was reported in Europe, the Pope Alexander VI* (1492-1503) drew an arbitrary line dividing the

* From *Life of the Admiral*, by Ferdinand Columbus

* The father of Cesare Borgia; see Chapter XLVII

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

new lands between Spain and Portugal, to the exclusion of all other nations. As far as a line drawn 370 leagues west of the Cape Verde Islands, everything was to belong to Portugal, west of that line, to Spain. This meant that Spain had practically a monopoly of America, and, fortified with this authority, she began to build up a new empire.

Even in the days of Columbus there had been friction between the Spaniards and the natives, and time did nothing to heal this antagonism, while the Spaniards were anything but conciliatory in their behaviour. Their cupidity had been aroused by traces of a mysterious people in the hinterland of Mexico who seemed to have access to gold and jewels. In 1519 an expedition was fitted out in Cuba and put under the leadership of Hernando Cortes. He was commissioned to explore Mexico, and for three months he led his men through forest and mountain until he reached the wonderful golden city of Mexico. By treachery and guile Cortes won from Montezuma, the ruler of this land, his treasures of gold and jewels, and reduced the native Aztecs to misery and degradation.

Eleven years later Peru, with its gold and silver mines and precious stones, was won for Spain by Pizarro. He persuaded the innocent natives to accept the Spaniards as gods after he had conquered their host, and murdered the king they had tried to ransom with a roomful of treasure. Pizarro took both the ransom and the homage, but refused to spare the unfortunate king; it was in this spirit that the Spaniards achieved their conquests in the New World, but their perfidy should not blind posterity to their wonderful courage in surmounting difficulties, and the resolution which enabled a mere handful of strangers to overcome a great host defending their native land.

By this time Central America, and the islands and the Gulf of Mexico, were becoming well known and finding their way on to maps of the "New World." The Pacific had been sighted in 1516; it was the Spaniard Vasco Nunez de Balboa, and not, as Keats thought, "stout Cortes," who stood "silent upon a peak in Darien." Florida and the mouth of the Mississippi had been explored, and a brave Spaniard named Orellana had succeeded in forcing his way across South America, crossing the Andes, and sailing more than 2,000 miles down the Amazon and its tributaries. Spain was firmly established in America, and shiploads of treasure, ingots of gold and silver, bags of rubies, and Mexican embroideries, were beginning to find their way from the New World to the old, to the chagrin and envy of all other European countries, excluded by the Bull of 1493 from sharing in the booty.

The French in North America.—French and English fishermen established themselves on the coasts of North America in the early years of the sixteenth century. They might be excluded from "El Dorado," whence the Spaniards drew their gold, but they could join in the fisheries off Newfoundland, where John Cabot had found fish so plentiful that they could be caught in baskets.

John Cabot and his sons set out from Bristol in 1497 and found and explored the coast of Labrador, perhaps the very shores that the Northmen had named "Markland" five hundred years earlier.* They had been disappointed in their search for the treasure they expected, but they had found wealth in the great shoals of cod round Newfoundland and the mouth of the St. Lawrence.

In 1534 the Frenchman Jacques Cartier explored the Gulf of St. Lawrence, and found Prince Edward Island. He hoped that the long inlet he noticed running westwards might lead him to the Pacific, and the following year he made another expedition to sail along this river. He found the natives friendly, and they quickly guided him to a precipitous mountain which he named "Mont Royal."† Cartier also named "Cap d'Espoir," anglicized as "Cape Despair."

At the end of the century, Champlain (*d.* 1635) continued Cartier's explorations up the St. Lawrence and reached Lake Ontario. He, too—and unlike the Spaniards—made friends with the Indians, whom he found a brave and kindly folk with a high standard of behaviour. Champlain founded settlements at Montreal and Quebec, which formed the nucleus of the French colonies in North America.

The English Seamen.—In the sixteenth century English seamen earned a reputation for skilled seamanship and outrageous audacity, which they most certainly deserved. Although England was technically at peace with Spain, feeling was running very high, and reprisals on both sides were made for alleged injustice. Most famous of all, to Englishmen a hero, to Spaniards a pirate, was Sir Francis Drake. In his early years he had served under John Hawkins, an Englishman engaged in slave trading between Guinea and the West Indies, and had then learned his remarkable seamanship and acquired a life-long detestation of Spain and her methods.

The German, Paul Hentzner, when travelling in England in 1589, said that the English were "good sailors and better pirates"; doubtless he was thinking of Drake. After an extraordinarily successful marauding expedition to Panama in 1572,

* See Chapter XXVI.

† The name survives in "Montreal," the town at its foot.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Drake set out five years later on an even more daring voyage. He told no one where he was going, and to the incredulous amazement of the Spaniards he appeared on the Pacific coast and proceeded to rob the treasure ships bound from Peru to Panama. In his little ship, the *Golden Hind*, Drake could outsail and outmanœuvre the clumsy Spanish galleons—it was a foretaste of the triumph England would win against the Spanish Armada not long afterwards.

As his retreat to the south-east, by Magellan Straits, was cut off by indignant Spaniards, Drake repaired his ship as best he might and boldly sailed across the Pacific with nothing to guide him but a chart of the Indian archipelago, looted from one of the treasure ships. Fortune favours the brave, and in 1580 Drake sailed back to Plymouth, little the worse for his adventure, and with the hold of his ship full of gold and silver.

Another Englishman, Sir Humphrey Gilbert (*d.* 1584), decided that it was time "to pare the nails of Spain," and in 1583 he had planted the first colony in Newfoundland. Sir Walter Raleigh (*d.* 1618), his step-brother, continued Gilbert's work, and evolved great and far-reaching schemes for settling North America. He took possession of lands between Newfoundland and Florida and planted his colony there, naming it Virginia in honour of Queen Elizabeth, who had given him his patent. It was a failure, and so were further attempts on Raleigh's part to find "El Dorado" in Guiana. Disgrace, recall, imprisonment and death were the fruits of Raleigh's enterprise; it was not until John Smith (*d.* 1631), the Governor of Virginia, convinced the settlers that "nothing is to be expected . . . but by labour" that the colonies began to flourish.

XLV

EXPLORERS OF EAST AND WEST

The Search for the North-East Passage. —Now that Portugal controlled the south-eastern route to the Indies, and Spain the Straits of Magellan in the south-west, men of other nations conceived the idea of trying to find a northern route to Cathay and India.

During the reign of Edward VI (1547-1553) a company was formed in England for the purpose of discovering unknown lands and establishing trade with them. The company was named the "Merchant Adventurers," and the first governor was Sebastian Cabot, who had explored the coast of Labrador with his father in the closing years of the fifteenth century.

One of the first expeditions fitted out was sent in 1553 under two captains named Willoughby (*d.* 1553) and Chancellor (*d.* 1556), to find a north-eastern route to the Spice Islands. They had no idea of the hardships and rigorous climate they would have to face, and their preparations were of the slightest. They did not even take stoves with them, or warm clothing or suitable stores, and the result was that many of the "adventurers" died of exposure. Willoughby and his party missed the others in a storm and, finding their retreat cut off by ice, they landed in Lapland, where they all perished miserably of cold and want.

Chancellor was more fortunate. After rounding the North Cape he found himself in the Arctic Circle and made his way to the White Sea. Landing at Archangel, he met some Russian peasants who led his party in safety across the snowfields down to Moscow, where they were presented to the Tsar Ivan the Terrible (1533-1584). They were kindly received and given permission to trade, and returned to England by the same route.

A few years later the company sent out another Englishman, Jenkinson, to follow up Chancellor's discoveries and to report on the possibility of an overland route to Persia and the East via Russia. From the Tsar's court he made his way down the Volga, and then struck overland to Bokhara. He was the first Englishman to travel from the White Sea to the Caspian. Jenkinson failed to open up trade with Persia, though he was sent out again in 1561, and the Merchant Adventurers had to be content with Russian hides and wax and honey, instead of the Oriental merchandise they hoped for.

The Search for the North-West Passage. —The spirit in which seamen undertook to find a way to the Indies by sailing to the north of America is illustrated by a contemporary account of Martin Frobisher's (*d.* 1594) first voyage. "He began first with himself to devise, and then with his friends to confer, and laid a plain plot unto them that that voyage was not only possible by the North-West, but also, he could prove, easy to be performed . . . he determined . . . himself to go make full proof thereof, and to accomplish or bring true certificate of the truth, or else never to return again; knowing this to be the only thing of the world that was yet left undone, whereby a notable mind might be made famous and fortunate."*

Frobisher's first voyage was made in 1576, and he discovered and named Frobisher Strait, which he was convinced was the beginning of the passage he was seeking. He brought home a curious black stone which was found to contain a small proportion of gold, and immediately a "gold

* From *Voyages of the Elizabethan Seamen*, edited by E. J. Payne, p. 88.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

rush" began. The Cathay Company was formed (in which Queen Elizabeth herself took shares) and everyone thought a new El Dorado had been discovered.

Further voyages proved this was an illusion, and the gold brought home did not pay the expenses of the expedition.

Other explorers followed where Frobisher had shown the way; Davis (*d.* 1605), Hudson (who was cast adrift by his mutinous crew in the huge bay that bears his name) and Baffin, who in 1616 found and named his bay, and also Lancaster Sound. Many lives were lost and many hearts were broken in this profitless search. Finally the Passage was discovered by the great explorer, Sir John Franklin, in 1847. The North-Eastern Passage defied discovery until 1879, when it was successfully negotiated by the Swedish explorer, Nordenskiöld.

The Terra Australis.—Just as there was a legend of a mysterious continent, Atlantis, lying to the west of the Azores, so there was a belief in a great southern continent, which was given the name of Terra Australis. When Magellan sighted land to the south, as he passed through his strait, he supposed it to be part of this land, not realizing that Tierra del Fuego is an island.

For a long while it was thought that New Guinea was a part of the Terra Australis, but a Dutchman named Honduis in 1595 drew a map showing it as an island, marking the strait known to us as Torres Strait (where the Spaniard Torres sailed ten years later).

The Dutch, as well as the English, had formed an East India Company to compete with Portugal in the East Indies, and towards the end of the sixteenth century they had established themselves in Java and began to gain control of trade in the Spice Islands. In 1606 they defeated a Portuguese fleet at Malacca, and a Spanish fleet the following year. They were more enterprising than the Portuguese and sailed boldly due east from the Cape, making full use of the July monsoon, instead of creeping up the African coast. In this way they sighted parts of Western Australia, and gave it the general name of "New Holland."

From 1636 to 1645 the Dutch East India Company was governed by Anthony van Diemen (*d.* 1645), and he it was who sent Abel Tasman (d. 1659) to explore the Terra Australis and, if possible, to open up trade with the natives. He was also to keep a careful record of all he heard and saw, and to make careful charts and maps. Blown out of his course by a westerly gale, Tasman sighted Tasmania (which he named "Van Diemen's Land"), believing it to be part of the mainland. He made the same mistake with regard to New Zealand, thus imagining the new continent much larger than it is.

From Tasman's time until the English buccaneer-explorer, William Dampier, visited Australia in 1688, "New Holland" remained a Dutch preserve, but the Dutch did not find the resources of the country of much practical use, at least of those parts they examined, and did not take the trouble to explore it with any thoroughness. It was left for the Englishman, Captain James Cook, to explore the coast in 1770, report favourably upon the country, and annex it as a British possession.*

XLVI

THE NEW EUROPE—SCANDINAVIA

The Union of Kalmar, 1397.—The union of the three kingdoms of Sweden, Norway and Denmark was intended to endure for ever. It was engineered by Queen Margaret, who ruled Denmark by right, Norway on behalf of her young son, Olaf, and Sweden by invitation. She was determined that the three countries should be permanently under the rule of one king, though each was to retain its own laws and institutions, but she neglected to make any arrangement for a court of electors, should there be any question as to the succession.

With this obvious defect, the union could last only so long as the succession was secure and there was no friction to cause a rift between three countries with diverging interests. In 1435 the union of Kalmar was formally confirmed by the Swedish Diet, but it had already begun to disintegrate, and it was actually Sweden that broke away from the union in 1524. Norway and Denmark remained united under the Oldenburg dynasty until the Congress of Vienna in 1815, when Norway was arbitrarily united with Sweden, to the discontent of both countries.

Scandinavia in the Fifteenth and Sixteenth Centuries.—The history of Scandinavia from the union of Kalmar until the time of Gustavus Adolphus is of little interest in the general history of Europe, and the civil wars and family feuds had no more effect upon European affairs than did the contemporary Wars of the Roses in England.

The Swedes objected particularly to the union because there was more national feeling in that country, and because the ruling family had no real connection with Sweden. Christian I did what he could to maintain the union, not with any lasting success, and his grandson, Christian II, tried to achieve the same result by violence and ferocity.

Christian II only succeeded in alienating the Swedes and raised violent opposition, where he hoped to inspire terror and cowed submission, in his notorious massacre, for

* See Chapter LV

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

instance, known to posterity as the "blood-bath of Stockholm." Yet Christian was an enlightened and cultured man, the friend of scholars and patron of the arts. In him the qualities of the "Renaissance prince" showed their darkest side; he was an exponent of Renaissance principles too literally interpreted.

While Europe was in the throes of the Reformation, Scandinavia produced no Luther or Zwingli, but adopted Protestantism almost casually, just as the Norsemen had adopted Christianity. It was not until the Thirty Years' War that Sweden was projected into the map of Europe.

Gustavus Adolphus, King of Sweden, 1594-1632.—Bolingbroke says of Swedish history: "Till that wonderful revolution which the first Gustavus brought about in Sweden, it is nothing more than a confused rhapsody of events, in which the great kingdoms and states of Europe neither had any concern nor took any part." He continues: "From the time I have mentioned, the northern crowns have turned their councils and their arms southwards, and Sweden particularly, with prodigious effect."

It was Gustavus Vasa who laboured to free Sweden from Danish authority, and it was his grandson, Gustavus Adolphus, who brought Sweden for the first time into European politics. The weakness of Sweden as a naval and commercial power was emphasized by the strength of the Dutch, who were gathering up the remains of Hanseatic power on the Baltic shores. Sweden could trade outside the Baltic only by paying Denmark tolls for permission to take her ships through the Sound. Her towns, too, were of small account; even Stockholm could not compare with those towns which had been prominent members of the Hanseatic League.

A tentative effort had been made to establish Swedish power on the further side of the Baltic, in Esthonia and Livonia, but the position was delicate, for these lands were situated "between hostile Poland and semi-hostile Russia." It was the new king's ambition to make Sweden mistress of the Baltic and to acquire good ports—Stralsund in particular. In addition to his other motives,* he had this end in view when he intervened in the Thirty Years' War and saved the day for Protestantism. The meteoric career of "the Lion of the North" has been briefly described elsewhere; here it must suffice to say that his work for Sweden was carried on to the best of his ability by Oxenstjerna, his friend and disciple.

The Career of Charles XII, 1697-1718.—When Charles XII came to the throne of Sweden in 1697, he was only fifteen years old, and inexperienced in the arts of war and diplomacy. The enemies of Sweden immediately concluded a nefarious alliance, hoping to overthrow the power of Sweden while she was weak. Russia wished to extend her territories on the Baltic coast and recover the provinces of Ingria and Carelia, taken from her by Gustavus Adolphus in 1616. Denmark wanted possession of Holstein, and Poland hoped to recover Lithuania, which had been declared a Swedish province by the Treaty of Olivia, 1660.

These three Powers combined to crush Charles XII, but they had strangely misjudged their victim. Charles was a born soldier, delighting in war, in its excitement and hardships and privations. Moreover, he believed in striking the first blow. In the early summer of 1700 he made an attack by land and sea, capturing Copenhagen with scarcely a blow, and paralysing the Danish opposition by the suddenness of his attack.

In Peter the Great of Russia (1689-1724), Charles found an opponent more worthy of his steel, but the unwieldy Russian force, huge in numbers, was still imperfectly organized and equipped, and when Charles met the Tsar's army at Narva (1700) he won a signal victory. Charles subdued Poland with ease, capturing Warsaw in 1702.

Saxony, too, he conquered, and then came his last great campaign, the attack on Russia which brought him ruin, as it did to Napoleon over a hundred years later. Despite every discouragement, through bitter frost and cold, the intrepid Charles led his men to the fortress of Pultava, in the Ukraine. But the Russian troops he now met (1709) were very different from the ill-disciplined fighters of Narva, and the exhausted Swedish Army was practically annihilated.

Charles escaped from the battle with his life but little else. He fled to Bessarabia and took refuge there among the Turks. From this fastness he tried from time to time to stir up trouble for the Russians, and to rule Sweden as best he might. At last he returned to Sweden in 1714, and the remaining four years of his life—he was killed in action—were spent in vainly trying to recover his lost provinces.

XLVII

ITALY AND THE PAPACY

The French and Spanish Wars, 1494-1559.—It was Lodovico Sforza, Duke of Milan, who played the traitor by inviting the French to Italy in 1494. In urging the French King Charles VIII (1483-1498) to renew the old Angevin claim to Naples, and to reinforce his claim by force of arms, Lodovico believed—or persuaded himself to believe—that he was redressing the balance of power in Italy and neutralizing the effect

* Touched upon in Chapter XLI.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of a much-to-be-feared alliance between Naples and Venice, the enemies of Milan.

Charles VIII needed little encouragement, for he was vain and ambitious and only too ready to believe in Lodovico's promise to make him "greater than Charlemagne." The French armies drove their way through Italy from north to south, entering Florence, Rome and Naples in turn, and ruthlessly exposing the worthlessness of the condottieri who attempted to oppose them. By February, 1495, Charles was in Naples, having proved that the mercenary armies, as Machiavelli declared, "did not take the field in winter." He could not, however, hold what he had won, and as soon as he turned his face northwards his influence in the south vanished.

Milan had opened the gates of Italy to France; now it was her turn to be attacked. In 1499 King Louis XII (1498-1515) advanced, not upon Naples, but upon Milan, and soon he had conquered the Duchy and Lodovico was a prisoner.

Louis XII next conquered Naples, wresting it from the Aragonese. But, like Charles, he could not hold it. The valiant Pope Julius II formed a Holy League against the French, and his determination and military skill led to the retreat of Louis's armies. The French won the Battle of Ravenna (1512) but lost their general.

Louis XII died in 1515. His successor was the young and ambitious Francis I (1515-1547). The Pope, Spain, Florence and the Swiss joined to oppose him, and it fell to the Swiss to meet the French forces at Marignano (1515). They fought with magnificent bravery, but were defeated. They had, since the fall of Burgundy, extended their influence over the Lombard plain, but after Marignano they gave up this ambition.

Meanwhile, Charles V had become Emperor, and soon Hapsburg-Imperial was substituted for French power in Italy. In 1527 the Imperial army advanced upon Rome, and, after a fierce siege, entered the city. The soldiery were uncontrolled and savage, and they looted, burned and destroyed in a manner horrible to behold. Cellini in his *Memoirs* has written a vivid eye-witness description of this dark episode. France and Spain-cum-Austria had made Italy their battlefield, and for more than twenty years this dreary warfare dragged on. At last, in 1551, the French Henry II (1547-1559), more enlightened than his forebears, decided to abandon his Italian possessions, and to concentrate on the more important task of strengthening his eastern frontier, and in 1559 he formally ceded to Spain all his Italian territories.

The Papacy in the Later Renaissance.—With the exception of Innocent VIII (1484-1492) and Pius III (1503), all the Popes at the end of the fifteenth century, and for the first two decades of the sixteenth, were men of great strength of character and more than ordinary ability.

Alexander VI (1492-1503), father of Cesare and the pathetic and ill-famed Lucrezia Borgia, was a man of violent passions which he did little to control. Yet he had the good of Italy at heart, and, with Cesare, made a desperate attempt to build up a strong central power. He was a patron of the arts, but he had none of the refinement of Pius II (1458-1464) or the overwhelming love of beauty of Paul II (1464-1471). In his eyes, the political character of his position as head of the Church, far outweighed the spiritual.

Julius II (1503-1513) was a born soldier, brave and formidable. His great object was to expel the French from Italy, and to it he gave all his energies and abilities. To him there succeeded a man of a very different type. This was the Medici Pope, Leo X (1513-1521), more "magnificent" son of Lorenzo il Magnifico. His love of luxury and show led him to devote his pontificate to the encouragement of painters and sculptors, the rebuilding of St. Peter's and suchlike ostentation, rather than to his duties as head of Christendom.

It was during the pontificate of another Medici Pope, Clement VII (1523-1534), that the terrible Sack of Rome (1527), took place. He was so circumstanced that the growth of Protestantism in Central Europe and the defection of the English Church seemed of small moment compared with more immediate dangers. More and more, the sixteenth-century popes tended to become political, and to fix their attention on retaining a precarious hold upon the Papal States, to their detriment as a spiritual power.

The Venetian School of Painting.—The last manifestation of Renaissance painting occurred in Venice, but it provided for the day of Italy's supremacy a sunset of unrivalled splendour. From Giorgione (*d.* 1510) to Tintoretto (*d.* 1594) and Paolo Veronese, Venetian painting of the sixteenth century has a mastery of grouping, a richness of colour, and a boldness of conception unequalled elsewhere.

Greatest of all Venetian painters was Titian, who died in 1576 at the great age of ninety. He did considerable work for the Farnese Pope, Paul III (1534-1550), who was also the patron of Palladio. Perhaps if any one of his pictures must be singled out for special praise it should be the "Flora," now in the Uffizi Gallery in Florence. The apparent simplicity of the subject conceals a great subtlety, and the exquisite delicacy of complexion has none of the "fleshiness" of Ruben's work.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

After Tintoretto's time Venetian painting was concerned with more ambitious subjects, great battle pieces and banquets and crowds and exaggerated storm-clouds and incongruous cupids, but the delicacy and charm of Titian's "Flora" remain the high-water mark of Venetian achievement.

XLVIII

SPAIN AND THE EMPIRE

Ferdinand and Isabella, 1474-1516.—In the year 1474 Isabella succeeded to the throne of Castile. By her marriage with Ferdinand, heir to the crown of Aragon, Isabella laid the foundation of a union between the two great kingdoms. Ferdinand succeeded in 1479, and Castile and Aragon, hereditary enemies from time immemorial, became one. Yet each state retained its own characteristics, and in this fact is found the reason for the collapse of Spain when the tide of prosperity turned against her.

With ruthless vigour Isabella introduced many and sorely needed reforms, and she and Ferdinand ruled with great efficiency, subduing rebellious nobles, expelling the Moors from their last province, Granada (in 1492), and reorganizing trade and industry. Isabella had a horror of heresy, and it was due to her influence that the Inquisition was set up, with Torquemada as its president, in 1483. In the year of the conquest of Granada the Jews were expelled from Spain.

The discovery of America by the Genoese Columbus, financed and authorized by Ferdinand and Isabella, has already been described. It would be impossible to overestimate the importance of this event in its influence upon Spanish history, for both good and ill.

The Emperor Charles V, 1519-1556.—Maximilian of Austria (*d.* 1519) laid the foundations of his grandson's territorial power by two fortunate marriages. He himself married Mary of Burgundy, and so obtained the greater part of the dominions of Charles the Bold, and he married his son Philip to Joanna, heiress of Ferdinand and Isabella of Spain. Thus Charles was born to a great inheritance, and in 1519 he was elected emperor. His lands included not only Austria, the Netherlands and Spain, the kingdom of Naples and Sicily, and Milan, but also other possessions of unknown extent in the New World. Since the days of Charlemagne no such empire had been seen in Europe.

Charles made it his business to champion Catholicism, and determined to stamp out Protestantism. He failed, but his efforts provoked the revolt of the Netherlands and ultimately the establishment of the Dutch Republic. With his great resources, Charles V seemed a second Charlemagne, but the unwieldy nature of his dominions made them a source of weakness rather than strength.

New ideas of nationality, the spirit of independence liberated by the Renaissance, the Protestant tendency to stiffen an already firm resistance in the face of persecution—all these were opposed to Charles. His own character, sensitive as he was, made him ill-fitted to rule with fierce efficiency, like Ferdinand, or with the far-sighted diplomacy of his grandfather, Maximilian. In 1556, feeling that circumstances were too much for him, and that he could bear his responsibilities no longer, Charles gave up his Imperial crown and retired to a monastery in Portugal, where he died in 1558.

Philip II (1558-1598) and the Decline of Spain.—When Charles V abdicated, the Imperial crown was given to his brother Ferdinand, and he was succeeded in Spain by his son, Philip II, who also held the Netherlands. Philip was an exaggerated edition of his father, with an additional strain of a strange melancholy fanaticism peculiarly his own. His struggle with the Netherlands resulted in the loss of the northern territories (i.e. Holland) and a useless expenditure of men and munitions.

In his dealings with England, Philip II was equally unsuccessful. His attempt to restore Catholicism there, through the medium of his wife, Queen Mary, was signally lacking in success; and, over thirty years later, the great fleet he sent after countless hesitations and delays was utterly destroyed. "God blew with his wind and they were scattered" is the motto of the Armada medal struck to commemorate the English victory of 1588. No weather conditions could have been worse for the Spanish fleet, and the great galleons were blown up channel and were at the mercy of the smaller, but more numerous and very much swifter and more experienced, English ships (see page 82).

The defeat of the Armada brought relief to the Dutch as surely as it brought freedom for England and ruin for Spain. Even the great wealth of the West Indies could not compensate Spain for this continual outpouring on fruitless enterprises, begun by Philip II and continued under his successors. Bolingbroke says, "Philip the second left his successors a ruined monarchy. He left them something worse; he left them his example and his principles of government, founded in ambition, in pride, in ignorance, in bigotry and all the pedantry of state."*

The rise of Spain had been swift and unexpected, and her suddenly acquired power was largely due to a series of fortuitous circumstances. When adversity came to test

* Letter vi on The Study and Use of History.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

that power, it was soon found to be hollow, and—to quote Bolingbroke again—"what compleated their ruin was this, they knew not how to lose nor when to yield."*

XLIX

THE NETHERLANDS

William the Silent (*d.* 1584).—For many years the Netherlands had suffered under Austro-Spanish domination. When Charles V abdicated in 1556 control of these provinces passed to his son, Philip II, "a meagre man," and a ruler unlikely to consider the interests and prejudices of a race with whom he had neither kinship nor sympathy. The Netherlanders had become firmly Protestant, and Philip's attempts by fire and sword to bring them back to Catholicism only increased their resistance. "The scaffold had its daily victims, but did not make a single convert."†

Oppression led to a rising tide of discontent, and ten years of Philip's rule were enough to cause revolt. The storm broke in 1572, when an association called the "Sea Beggars" captured the seaport of Brill, at the mouth of the River Maas. The revolt, which had been spasmodic since 1566, now became general, and a leader was found in the young nobleman, William, Prince of Orange. This William "the Silent" had often been employed by Charles V on diplomatic missions, and had thus learned the self-control which gave him his nickname.

The best of Spain's armies, under the Duke of Alva, were sent to subdue the rebellious provinces. Volunteers from all over Europe also offered to fight on one side or the other, simply from sheer love of adventure.

William the Silent was a splendid leader, with great resource and determination. When the town of Leyden was besieged and starved almost into submission in 1574, he determined to sail his ships overland to the relief of the town. The sea-dykes were broken, and the water came pouring over the land to a depth of several feet, so that the flat-bottomed ships could sail right up to the walls of the town, while the Spaniards retreated hastily in search of dry land. The sacrifice was great, but the heroic defence succeeded. Leyden was saved, and the Spaniards thoroughly discomfited.

In 1579, by the Union of Utrecht, the seven northern provinces formed themselves into a single state, but the ten southern provinces—now Belgium—went back to their allegiance to Spain and remained the Spanish Netherlands. In 1609 a so-called truce was arranged for twelve years. But before this time William the Silent had been assassinated by a fanatic, in July, 1584. The whole country mourned his death, and took horrible vengeance on the assassin. Of William the Silent it has been said, "As long as he lived, he was the guiding star of a brave nation, and when he died the little children cried in the streets."*

The United Netherlands, 1579-1713.—The United Provinces formed themselves into a loose confederacy, under the authority of a federal Parliament. A Stadtholder was appointed for the whole confederacy, and this office became unofficially vested in the House of Orange, to whom the Dutch always looked for leadership. In the Thirty Years' War, a son of William the Silent (the Stadtholder Frederick Henry) led the Dutch to victory against Spain in the Lower Rhine, and won for the United Provinces complete and official recognition of their independence by the Treaty of Münster.

When the danger of Spanish domination was removed, however, civil war broke out between the "Orange" party and the burghers, headed by de Witt. On the death of William II of Orange (1650) power passed into the hands of the burgher, John de Witt, and under his capable guidance Dutch commerce was greatly developed.

The English Navigation Act of 1651 was intolerable to the Dutch, and the cause of a naval war which culminated in the famous Dutch venture up the Medway in 1667. Meanwhile, Louis XIV, claiming some fanciful rights over Brabant, had attacked the United Provinces, and disaster threatened. But de Witt rescued his country by engineering a Triple Alliance with Sweden and England, against the might of France.

When Louis XIV succeeded in buying English allegiance by the Treaty of Dover (1670), the Dutch were again in the gravest peril, and it was only the life-long resolution and energy of the young William III of Orange† which prevented absorption by France. Louis was distracted from putting the full strength of France against them by his numerous other interests, and the Dutch never had to bear the full brunt of a French attack. Yet the danger was ever-present, and it was not until the Peace of Utrecht in 1713 that they reaped the reward of their courageous resistance.

The Dutch School of Painting.—Flanders had been more affected by the Renaissance than had the northern provinces, where the most typical work was not produced until the seventeenth century. The Flemish Rubens has the pagan spirit, the joy in life

* Letter vi. on The Study and Use of History.
† Motley: *Rise of the Dutch Republic.*

* The closing words of Motley's *Dutch Republic.*
† Afterwards William III of England. De Witt and his brother had been murdered in 1673.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and the rich, warm colouring generally associated with Giorgione (*d.* 1510). In the calm, contemplative studies of Pieter de Hooch (*d. c.* 1683), the Dutch spirit finds its expression, that love of home and simple things which nerved the Dutch for their heroic struggle.

The Fleming Pieter Brueghel (*d.* 1569), and his two sons, have something akin to the Dutch feeling for everyday life, with their scenes of busy villages and queer little towns, and minute descriptive detail. But there are dignity and serenity, as well as a warmth of glowing colour, in the Dutch paintings which are not to be found in the Brueghels' work. Interiors of ordinary houses, groups of civic dignitaries, portraits of their wives and daughters, studies in still life, all these subjects appealed to painters of the Dutch school, and they achieved a very high degree of skill in technique.

Two generations of the family of Cuyp were distinguished as landscape painters, particularly Albert Cuyp, who died in 1691. In the flat pasture lands, with winding streams and lush meadows and wide, unbroken expanse of sky, Albert Cuyp found subjects perfectly suited to his genius. Another painter who loved skies and flat land was Hobbema (*d.* 1709); one of the best known of his pictures is "The Avenue," now in the National Gallery in London.

One Dutch painter who failed to find appreciation during his lifetime, but whom posterity has placed among the greatest artists of the world, is Rembrandt van Rijn (*d.* 1669). Seven years before his death, Rembrandt visited England; if only some patron had given him the opportunity his work deserved, the galleries of Hampton Court might be adorned with a series of unrivalled portraits instead of the indifferent paintings of bovine court ladies by the facile brush of Lely (*d.* 1680).

Rembrandt's bold handling of light and shade alarmed and sometimes offended his contemporaries. When he was painting a picture of the City Guard, instead of a conventional group of recognizable portraits, such as Holbein might have produced, Rembrandt produced a bold effect of shadow which entirely concealed the features of some of the seventeen members—who had paid their quota towards the artist's fees and were thus greatly disgusted. This picture now hangs at Amsterdam, and is generally thought Rembrandt's masterpiece; at the time it brought him nothing but censure.

Enough has been said to show how the Dutch painters of the seventeenth century reflected the spirit of the nation, its seriousness, preoccupation with everyday life, and courageous innovation. And, it must be added, its essentially commercial outlook.

L

ENGLAND UNDER TUDORS AND STUARTS

Tudor England.—After the desultory and profitless fighting which posterity has named the Wars of the Roses (*c.* 1455-1485), England was ready to benefit by the "governance" she had so conspicuously lacked in the fifteenth century. This was just what the Tudor sovereigns could supply, and under their guidance England made a swift recovery from her ills, and by the end of the next century she was ready to play her part in European politics.

Under Henry VII (1485-1509), the influence of the nobility was greatly weakened by the Statute of Retainers, which prevented them from keeping a permanent fighting staff in their castles and mansions, and by the ingenuity of that wily minister, Cardinal Morton (*d.* 1500), who, like Cosimo de Medici, "used taxes instead of a dagger."

In his early years Henry VIII (1509-1547) was a typical Renaissance prince, gifted and charming, admired by the whole nation. Most people remember only that he had six wives (Professor Pollard points out that they cling to him much more closely after death than they did in life) and forget that he gave his country good government and an opportunity to develop its commerce and civilization.

During the early years of the sixteenth century the woollen trade greatly developed, and this led to a large increase of sheep farming. Arable land was "enclosed" for pasture, while those who had hitherto worked the land were unemployed. This was the cause of much of the distress and poverty and vagrancy which mark this time. "The husbandmen be thrust owte of their owne," wrote Sir Thomas More (*d.* 1535) in his *Utopia*, or description of the ideal state, ". . . what can they then els doo but steale?"

The distress was intensified when the monasteries were dissolved by order of Henry VIII, and numbers of homeless wanderers who had depended on the monasteries for food and lodging had to seek it elsewhere. Some of the monks became vagrants. This was the greatest problem which faced Tudor England, and the state made sincere though not always effectual attempts to solve it, culminating in the Elizabethan poor law of 1601.

The English Reformation has been described elsewhere (see Chapter XLI), and so have the struggle with Spain and the English efforts to secure dominion overseas; but before passing on to the Stuarts something must be said of the great age of the English Renaissance.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Age of Elizabeth.—The Renaissance came late to England, but it came with a richness and fullness which were worth waiting for, and it produced in Shakespeare (*d.* 1616) a great creative artist second to none in the whole history of civilization. As poet and dramatist Shakespeare is supreme, yet he owes much to the example and precept of those playwrights who brought the drama, within a single generation, from obscurity to fame. Indeed, Marlowe (*d.* 1593) is inferior only to Shakespeare himself, and the lesser dramatists in any less brilliant age would have been famous.

The lyric poets, from whom it would be invidious to select names, Spenser (*d.* 1599) in his *Faerie Queene* and *Shepheards' Calender*, Bacon (*d.* 1626) in the terse vigour of his *Essays*, Raleigh (*d.* 1618) in his *History of the World*, each in his different sphere expressed the new vitality and the new spirit which now possessed English literature. Much of the material was borrowed; Shakespeare in particular showed great ingenuity in adapting other men's plots, and many of the old forms were used, but all the literature of the time is informed with the Renaissance spirit.

The queen herself became the centre of a cult; poets wrote of the charms and beauties of "Gloriana," and the new colony in America was named "Virginia," also in her honour. Being the shrewdest of rulers, Elizabeth knew how to exploit and commercialize this enthusiasm; she commanded magnificent loyalty and devoted service at the expense of the most meagre of rewards.

The new spirit of adventure sent men voyaging across the seas, and at home it led them to experiment with new forms and new ideas; in these days nothing seemed too difficult for the human body, nothing too ambitious for the human mind.

The Civil Wars.—When Elizabeth died in 1603, the English crown passed to the son of the ill-fated Mary Queen of Scots, James VI, who became James I of England. The union of England and Scotland under one ruler promised well for the peace of Britain, but it was in the reign of James I that the rift between King and Parliament first appeared. Under his son Charles I (1625-1649) it rapidly widened, for Charles, though well-meaning, was unfortunate, and by 1642 the king and his friends were at such odds with Parliament that civil war was bound to result.

In the desultory fighting which followed between the Cavaliers on one side and the Roundheads, or Parliamentary forces, on the other, the latter triumphed. The position was unsatisfactory; the king could not be trusted to keep his promises, and finally, in 1649, the whole western world was shocked by the news that Parliament had arraigned condemned and finally executed King Charles I. On the death of the king a Commonwealth was formed, which was virtually controlled by the Parliamentary leader, Oliver Cromwell (*d.* 1658), who became Lord Protector in 1654.

The issues at stake in the civil wars are so complex that it is impossible to expose them in a few words. Generally speaking, the struggle lay between the exaggerated conception of kingship—the "divine right" claimed by the Stuarts—and the solid common sense of the middle classes, who even in Elizabeth's day had shown unmistakably that they would not tolerate oppression. But whereas the Tudors had deferred to Parliament, while using it as their instrument, the Stuart kings, except Charles II, disregarded its rights, privileges and—worse still—its prejudices.

The Restoration and "the Glorious Revolution."—The Commonwealth survived Cromwell's death by only two years, and it was decided to offer the throne to the son of Charles I, then in exile in France. Remarking that he had no wish to set out on his travels again, Charles II (1660-1685) embarked upon the difficult enterprise of harmonizing warring elements in Church and State, and of dealing with a critical situation abroad.

Superficially, Charles was a light-hearted and somewhat profligate ruler, the despair of his sober-minded councillors, who, when his signature was needed for some important document, would be found playing tennis, or talking with Tompion, the clock-maker, or Nell Gwynn, the orange-girl. But behind this levity Charles hid a very shrewd brain. He gave the country what it needed, time to recover from the ravages and bitterness of civil war, and the reaction against Puritanism was a very natural one.*

Had his brother, James II (1685-1688), possessed equal brains, he might have kept his throne, but he alienated sympathy by an ill-judged attempt to re-introduce Roman Catholicism in a country just recovering from religious conflict, and in 1688 he was forced to make way for his son-in-law, William of Orange. This revolt vindicated the right of Parliament to decide upon the succession to the throne.

William of Orange refused to be the mere king-consort of his wife, Queen Mary, and he was crowned as William III. His affections were still concentrated on his native Holland, but he controlled a difficult situation with great success, thanks partly to the great personal popularity of Queen Mary, who was sweet and charming. Soon after the accession, a Bill of Rights was drawn up, and passed in 1689. This com-

* The life of the time is described in the diaries of Pepys and John Evelyn

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pleted the work begun in Magna Carta, and placed the crown of success on a revolution to its contemporaries "glorious," to posterity merely sensible.

LI

THE ASCENDANCY OF FRANCE

France in the Sixteenth Century.—When Henry II (1547-1559) had the originality to turn his back upon the Italian policy of his forerunners, he took the first step towards building up that power which gave France an ascendancy, both moral and political, during the reign of Louis XIV (1643-1715).

Henry II left as his widow the ambitious and crafty Catherine de' Medici (*d.* 1589). As queen-mother, and regent for her young son, she had ample opportunity for furthering her schemes, which she pursued ruthlessly by means of plot and counterplot. She it was who instigated the murder of Huguenots on St. Bartholomew's Day, 1572, the massacre which profoundly shocked and horrified all Protestants and all but fanatical Catholics.*

Until the accession of Henry of Navarre as Henry IV, in 1589, and for five more years until he had become a Catholic, France was torn and ravaged by civil war. The Edict of Nantes (1598) ended religious strife by granting toleration and civil equality to the Huguenots. In 1610 Henry IV was assassinated, but he had already done much good for France in providing strong and efficient government where he had found nothing but confusion and intrigue.

The Ambition of Louis XIV.—When the young Louis XIV succeeded to the throne in 1643, he was dominated and controlled by his minister, Cardinal Mazarin, who, until his death in 1661, held almost absolute authority in the state, imposing his will upon his own and other countries and educating the young king to pursue the course mapped out for him. Mazarin himself was only following out the policy begun by his even greater predecessor, Cardinal Richelieu (*d.* 1642). Richelieu had great ambition, and aimed at no less a feat than restoring to France the ancient frontiers of Gaul.

The gallant struggle made by the Dutch against the aggressions of Louis in the Netherlands has been noticed above, also the English opposition to his schemes converted into problematic support by the Treaty of Dover (1670). Twice the Dutch saved their country, and Louis realized that in William III of Orange he had a vigilant and formidable enemy. When William ascended the English throne in 1688, Louis knew that there was no question of continued friendship with England; William had too long a memory.

The last war of Louis's reign was provoked by his own ambition and greed in trying to secure for his grandson the throne of Spain. When Louis married Maria Theresa, the King of Spain's daughter, he expressly renounced any claim to the succession. Yet, when the last Hapsburg King of Spain died in 1700, leaving a will in favour of France, Louis XIV accepted the crown for his second grandson, exclaiming grandiloquently, "*Il n'y a plus de Pyrénées!*"

But this was more than Europe would stand. So long as Louis was extending his kingdom towards its natural boundaries, the Pyrenees on the south and the Rhine on the east, there was no cause for undue alarm. The union of France and Spain was, however, an intolerable idea. In 1702 the War of the Spanish Succession broke out, between France and the Grand Alliance formed to check French ambition. William III of England died the same year, but he left one of the finest of generals to carry on the struggle.

This was the Duke of Marlborough, and he and Prince Eugène of Savoy won a brilliant victory at Blenheim (1704), followed by further victories at Ramillies (1706) and Oudenarde (1708). In 1713 agreement was reached that France and Spain should never be united. The general arrangement of

Cardinal Richelieu, who held the office of chief minister of France from 1624 to 1643

* Philip II of Spain is said to have laughed for the only time in his life when the news was brought to him.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Louis XIV, the "Sun King"

Europe merely repeated the Settlement of Westphalia (1648), though the Spanish Netherlands, Lombardy and Naples were given to Austria and England was allowed to keep Gibraltar, which she had won from Spain in 1704.

Thus the great schemes of Louis XIV had shrunk away, and his long reign ended in gloom despite the brilliant promise of his early and middle years. He himself, the greatest of "Grand Monarchs," survived the Treaty of Utrecht by only two years.

Versailles.—Louis XIV began the rebuilding of the Palace of Versailles, and inaugurated a new era that rivalled the dynastic arts of the Pharaohs and the god-emperors of Rome. Louis, "*Le Roi Soleil*," took as his emblem the sun, and he built the Palace of Versailles as his temple. More than half the nobility of France was domiciled in this vast palace and engaged continuously in ceremonial ritual round the person of the king. The royal establishment numbered 14,000 people, and the whole artistic resources of France were concentrated in glorification of the Grand Monarch.

The architect, Hardouin-Mansart (*d.* 1710), put his best work into designing the palace, the chapel and the beautiful orangery with its twelve hundred orange trees. A vast French industry of applied art was created for Versailles by the king's great minister, Colbert, who encouraged the Gobelins, makers of fine tapestry, bought their establishment, and founded the Sèvres factory as a State concern.

The gardens were of unsurpassed magnificence. Groves, alleys and terraced lawns were there, and a "Grand Canal," complete with Venetian gondolas. The great problem was to provide sufficient water for the fountains and waterworks in which the king delighted, and many lives were lost and vast sums of money expended in the attempt to bring water to Versailles from the River Eure.

A wonderful description of life at Versailles is given in the *Mémoires* of the Duc de Saint-Simon (*d.* 1755): of its artificiality, gorgeousness, scandal and ennui. Some of the greatest writers of the time* were there, and it was at Versailles that the masterpieces of the veteran Corneille (*d.* 1684) and the tragedies of Racine (*d.* 1699) and the witty comedies of Molière (*d.* 1673) were produced. In the chapel, Bossuet (*d.* 1704) thundered out his sonorous sentences and held the whole court spellbound with the strength and eloquence of his sermons.

In painting, the neo-classical Nicholas Poussin (*d.* 1665) and his landscape-painting brother, Gaspar (*d.* 1675), were producing their delicate pictures, and they in turn gave place to Antoine Watteau (*d.* 1721). Watteau led a revolt against a classicism growing so rigid as to become pompous, and painted pictures of great delicacy, which at once reflect the spirit of the age and hold the seeds of impressionism.

To visit Versailles is to walk back into the past, for no place is so permeated with the spirit of its founder. The artificiality and extravagance remain to remind us of the unheeded labour which went to its construction, and our imagination is stimulated to consider the brilliance, wastefulness and boredom that life meant at the court of "*Le Roi Soleil*."

LII

RUSSIA FROM IVAN III TO PETER THE GREAT

The New Despotism.—Out of the rule of the old Tartar princes arose the Tsardom of Russia. Out of a series of independent oligarchies, not unlike the feudal structure of western Europe, though less highly organized, there arose a Russia unified under the control of a number of remarkable rulers. The new despotism in Russia was unlimited in aims and entirely guided by the caprice of the monarch seated in Byzantine splendour on his throne at Moscow.

Russia's vast size, her religion—divorced as it was from metaphysics—and the semi-oriental nature of the Slav, were chief in a variety of complicated factors which contributed to the character of her government during the next four centuries.

* The Academic Français had been founded by Richelieu in 1635

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Ivan III (1462-1505) and his successor, Basil III (1505-1533), consolidated the despotism of Russia by undermining the constitutional liberties of such important medieval Russian centres as Novgorod. When Ivan the Terrible came to the throne, Russia had been transformed into a unity not unlike that of the later Roman Empire, but with this difference, that economically and culturally its future was before it. Most of the population were peasants, conservative and inarticulate as they still remain. The articulate expression of Russia was the court, pompous, magnificent, barbaric, dangerous.

Ivan the Terrible (1533-1584).—This was the monarch who, in 1547, first insisted upon being entitled Tsar of All the Russias. Megalomania, that most Russian of all abnormalities, manifested itself in Ivan the Terrible at an early age. He ruled with a firm, and finally with a savage, hand. A corps of armed retainers was organized, the "Oprichniki," several thousand strong, who scoured the country for evidence of treason and terrorized all the kingdom. In Novgorod alone, the chroniclers state, some 60,000 inhabitants were massacred. Such was Ivan IV's Reign of Terror.

In the sixteenth century Russia was mainly peopled by a nomadic agrarian population, and was thus territorially in a state of flux owing to the movements of the peasant settlers in search of fresh ground. Such settlers formed themselves into bands, the Cossacks, fighting herdsmen who constantly ravaged the country, and thus sporadically gained more and more territory for Russia.

The Polish wars resulted in further acquisitions. Poland and Lithuania were tempting to Russian ambition, and Ivan forestalled the foreign policy of Peter the Great by trying to obtain political relations on the Baltic and with the Western Powers. Conflicts with Poland and Sweden were in the main abortive.

At Ivan's death, in 1584, one potential advantage gained was a Russo-English alliance.*

The "Troublous Times."—It is a commonplace of history that a weak monarch brings out the weakness of a despotism. Theodore (1584-1598) was such a man, and without the aid of his brother-in-law, Boris Godunov, the Russian despotism would almost certainly have collapsed. Boris Godunov was the agent of two landmarks in Russian history, the recognition of serfdom—attaching the peasants to the land and so preventing their migration—and the creation of the patriarchate. The first secured the smaller landowners from losing their peasant labourers. The second established the independence of the Russo-Greek Church.

Until 1613, the age known as the "Troublous Times," a series of insurgents and impostors occupied the throne until the accession of the Romanovs, with Michael Romanov (1613-1645). Under his successor, Alexis (1645-1676), the Patriarch Nikon organized a movement for ecclesiastical reform. This caused in the Russian Church schisms and heresies innumerable, which marked the beginnings of the breakdown of the old order of things and paved the way for the introduction of Western modes and fashions in the next century.

Peter the Great (1689-1725).—Prior to the reign of Peter the Great (1682-1725) Russia was little known beyond its own limits. Having practically no seaboard, it was found difficult to encourage trade—the greatest of international bonds. The feudal nobles, the Church and the military caste made for disunion, and a ruler was needed with sufficient force of character to destroy these centrifugal elements and to bring Russia into line with the Western nations. In Peter the Great such a ruler was found. He showed a genius for the absorption of foreign ideas. His greatest feat was the creation of a navy, for which purpose he made an extended tour through Germany, Holland, England, France and Austria, even working with his own hands in the shipyards of Amsterdam.

The keynote of his policy was the acquisition of ice-free ports on the Baltic, and this policy involved war with Sweden. In 1700 his new-model army was tried against Narva and failed. Nine years later the fruits of rigid training were gathered at Pultava, where Charles XII of Sweden met the fate common to most Western invaders of Russia. Vastly superior numbers destroyed the bulk of the Swedish Army, and by the terms of the Peace of Nystadt (1721) the Baltic provinces were secured for Russia.

His other object, control of the Black Sea, involved conflict with Turkey, and here he was unsuccessful.

Peter's reforms were radical and far-reaching. They concerned the army, the fiscal system and local and central government. Western institutions were adopted, the Senate, the Rathaus, guilds, aldermen, the social system which prevailed elsewhere. But the core of Russia remained as indolent and as obscurantist as before. From Moscow Peter the Great removed the court to St. Petersburg (now Leningrad), which he founded as "a window through which his people might look into Europe." He, with Louis XIV and Charles XII of Sweden, form a trio of exponents of the "Grand Monarchy" of their time.

* Engineered by English traders.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A period of disorder and reaction followed the reign of Peter, but in 1762 Catherine the Great ascended the throne. She began a policy of territorial expansion which brought Russia increasingly on to the European political stage.

LIII

CIVILIZATION IN THE WEST, 1550-1720

Science and Philosophy.—The discoveries and experiments of Leonardo da Vinci have already been noticed; he was the forerunner of the scientists of the next two centuries, who discovered scientific laws of the first importance. A Pole named Copernicus (*d.* 1543) demonstrated that the earth moves round the sun, and when this theory was reaffirmed a hundred years later by Galileo (*d.* 1642), the Papacy decided that this was a dangerous and subversive doctrine, and Galileo was forced to deny his "impious" theory.

During the reign of Charles II (1660-1685), the Royal Society was founded in England, and it was an Englishman, Sir Isaac Newton (*d.* 1727), who discovered the law of gravitation. Another Englishman, named Harvey (*d.* 1657), had discovered by dissection the circulation of the blood and published a book on the subject in 1628. All these discoveries had great and far-reaching results.

Seventeenth-century Holland produced two great thinkers who have had profound influence upon posterity. One was the lawyer, Grotius (*d.* 1645), a famous scholar and barrister, who propounded the Law of Nations in his book, *De Jure Belli et Pacis*, published in 1625. He was an exponent of International Law, and it is possible to see in him the original founder of the comity of nations. The other was the Dutch philosopher and spectacle maker, Spinoza (*d.* 1677). The French philosopher and writer, Descartes (*d.* 1650), also belongs to this period.

Music.—In almost every country outside Western civilization music remains but an adjunct of poetry and dance. The famous rota, "Sumer is icumen in" (*c.* 1250), was perhaps the earliest form of four-part song, which led directly to the golden age of music in the Elizabethan era.

The French, Spanish and German composers of this Golden Age were mainly church composers; O. Lasso (*d.* 1594), Palestrina (*d.* 1594) and Hassler (*d.* 1612) flourished as organists and religious composers; but in England there grew up a pastoral school which has given to the world some of the most delightful madrigals and part-songs of any epoch. It was one of the essential talents of the gentleman that he should be able to sing in harmony at sight, and for this art Byrd (*d.* 1623), Morley (*fl.* 1590), Campion (*d.* 1620) and Orlando Gibbons (*d.* 1625) wrote their charming songs.

The next century saw the cultivation of the solo voice which developed together with the violin, the most expressive of the instruments used to support it. The cultivation of instrumental technique had a grave effect on that of the voice, and Italian technique soon developed into a monstrosity that corrupted musical taste. The operatic aria as matured by Scarlatti (*d.* 1757) was, at its worst, a fine opportunity for a gorgeously dressed singer to display feats of vocal gymnastics.

The principal new art forms of the seventeenth century were the aria and the sonata. The second was mainly derived from the necessity for ballet music in opera and was hence greatly to the taste of the court of Louis XIV.

Painting and Architecture.—The seventeenth century was pre-eminently the age of the court painter. Pictures of King Francis I and his friends had been painted by Clouet (*d.* 1541), a painter of Flemish origin. Vandyck, who settled in England in 1632, was also a Fleming. He found admirable subjects for his brush in Charles I and his children.

In Spain, one of the greatest of all painters, "El Greco"* (*d.* 1614), depended for his effects upon brilliance and strength of light and shade. He had been a pupil of Titian and had acquired his wonderful knowledge of drawing in that master's studio. The courtly Velasquez (*d.* 1660) painted many charming pictures, including the little "Don Balthazar Carlos" on his prancing pony. Velasquez it was, too, who found and patronized Murillo (*d.* 1682), the painter of peasants and dark-eyed Madonnas.

Architecture in Europe had by the seventeenth century entered upon the phase known as "baroque," when the tendency was towards floridity and flamboyancy, and interior decoration could only be conceived in terms of gilt and cherubs. In Italy the architect Palladio (*d.* 1580) built in neo-classical style many churches and villas in North Italy and Rome, where he worked for the Farnese Pope, Paul III (1534-1550). His buildings were mainly of brick, covered with stucco, and his imitators all over Europe based their designs on his drawings published in book form in 1570.

An Englishman who fell deeply under Palladio's influence, and who translated his book into English, was Inigo Jones (*d.* 1652). Another famous architect was Sir Christopher Wren (*d.* 1723), whose works are too well known to need recapitulation.

* His true name was Theotocopuli.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

His great opportunity came when the Fire of London (1666) destroyed a great part of the city and cleared the way for rebuilding.

Literature.—In France, interest is chiefly centred round the great dramatists.* In Spain a literary Renaissance was taking place, and the "picaresque" novel was growing immensely popular. In *Don Quixote*, first published in 1605, it reaches its greatest height, and the author, Cervantes (*d.* 1616), ranks among the greatest of all writers. There was the prolific Lope de Vega (*d.* 1635), too, whose numerous "cloak and sword" comedies served as models for Molière.

The Restoration of the monarchy in England brought with it the cultural influences and moral standards of the French aristocracy. The theatres were reopened once again, but drama had ceased to be the supreme expression of the national spirit as in Elizabethan times, and reflected the manners and tastes only of the court and its entourage.

Of English writers of the seventeenth century, the name of John Milton (*d.* 1674) stands out, and suggests his great masterpiece, *Paradise Lost* (sold to a publisher for ten pounds). Nor must his work as a propagandist be forgotten. Between 1641 and 1660 he published twenty-five pamphlets, in which he upheld liberty in religious, domestic, educational, civil and literary matters. Of these the most famous is *Areopagitica: A Speech of Mr. John Milton for the liberty of Unlicenc'd Printing, to the Parliament of England.* At the end of the century there grew up a new school of poets, known as the Augustan School, who took Virgil and Horace as models for imitation. Pope (*d.* 1744) is the best-known exponent of this school.

In the reign of Queen Anne it became the fashion to meet in the coffee houses and discuss the news of the day, and writers and wits would sip chocolate and make jokes and comb their prodigious wigs. The coffee house was as much a part of social life as the powdered wig or the sedan chair. Steele (*d.* 1729) and Addison (*d.* 1719) conceived the idea of the first newspaper, the *Tatler*, soon followed by the *Spectator*, which should take the place of the old broadsheet. They wrote for their paper in delightful prose.

At the same time, Swift (*d.* 1745) was producing satirical pamphlets of the highest degree of incisiveness, and Congreve (*d.* 1729) was writing the wittiest of comedies. There are those who think that the age of Queen Anne deserves the title of "golden age" of English letters, but others see it as a time of sparkle and reflection rather than of true inward light.

* See "Outline," Chapter LI

LIV

PARLIAMENTS AND POWERS

ENGLAND UNDER THE HANOVERIANS

The Hanoverian Succession.—In 1714 George, Elector of Hanover, succeeded to the throne of England. The new king was entirely German in outlook and sympathies; he could not even speak English. So it was that many former functions and prerogatives of the crown passed to Parliament, and England became a "crowned republic" dominated by the Lords, for the methods of bribery introduced by Walpole (chief minister from 1721-1742) robbed the House of Commons of its freedom and vigour; the country entered a phase that Disraeli called the "Venetian oligarchy."

The parliamentary franchise was in great need of reform, to get rid of "rotten boroughs," to abolish corruption, and to establish a uniform system. Wealth in the form of landed property was the keynote of political advancement and the open sesame to the House of Commons. Rich adventurers purchased their seats and supported any ministry for the sake of honours and court favour. "The theory of an equipoise in our legislation had been distorted in practice," says Erskine-May. Yet this was the corrupt system that produced such rulers as Walpole and the Pitts.

The epoch that followed the Revolution of 1688 saw corruption in every branch of public life. The lawyers had proclaimed that "Whatever is is right—if it can show a charter." It is not surprising, therefore, that the greatness of England in the eighteenth century is to be judged by her individual men, by the creative achievement of her free and vigorous population.

Swift, Wesley, Clive, Captain Cook, Dr. Johnson and William Blake, to mention but a few great names, were unhampered by corporate institutions such as the Church, Civil Service or Universities. But the highly civilized world of which Dr. Johnson and Burke are typical minds, could think only in terms of politics and literature. They were blind to the changes in the economic structure of the country that were advancing upon them. Under the Hanoverians, while art, literature and music flourished and the foundations of the British Empire were being firmly laid, quiet and self-contented England slid unawares into a seething cauldron of trouble from which a very different world emerged in due time.

During the reigns of George I and George II, the policy of British ministers at home and abroad was guided by the necessity of maintaining the House of Hanover on the throne. This was held to involve the con-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tinuance in office of the Whig Party, but only conformists to the Anglican Church were to enjoy political power. The Tories, disaffected to the House of Hanover, were unwilling to take part in a restoration of the Stuarts or the Roman Catholic religion, though they occasionally drank the health of "the king over the water."

In Scotland there was no such moderation of feeling, and in 1715 there was a Jacobite rising on behalf of the Pretender. Led by the Earl of Mar in Scotland and the young Earl of Derwentwater in England, the insurgents rode into Lancashire. But French help was not forthcoming, and the little force surrendered to the royal troops in Preston. It was fortunate for the stability of the new order that the first effort of the Jacobites had taken place before the Hanoverians had had time to attain their full measure of unpopularity. The Whig Government took active measures, and the "Septennial Act" (1716) was passed, lengthening the duration of Parliament to seven years.

Meanwhile George was anxious to make himself safe on the throne, and with this end in view he aimed at the friendship of France. In 1717 the Triple Alliance was signed with France and Holland to ensure that Spain did not overthrow the Treaty of Utrecht, made three years earlier. Two years later (1719) they were joined, in a quadruple alliance, by the Holy Roman Empire. George's friendship with France caused a schism in the Whig Party, and in 1721 the Walpole Whigs, anxious to extend the power of England by peaceful means, obtained office.

George II (1727-1760). — Walpole remained in office until 1742, when his unpopular handling of the War of the Austrian Succession (1740-1748) caused his fall. His ministry was one of great importance, for it was one of retrenchment and reform and, in spite of the abuses in the parliamentary system, great measures were effected. By rigid economy and peace the national debt was reduced and, though often "raided," sinking funds for final redemption were started. Walpole's peace policy coincided with the French policy of peace under Fleury. A strict mercantilist with leanings towards colonial preference, Walpole aimed at making the colonies supply Britain with raw materials. His excise scheme, excellent in itself, was opposed lest an attack on corn protection should follow. He remarked, "Merchants bleat like sheep, but landowners squeal like hogs," and hence he left the land tax alone.

In Cabinet government, likewise, great steps were made. The need for a chief minister was felt, for the influence of the king had been entirely removed on the accession of George I. By his supremacy over the other members of the Cabinet Walpole quickly became England's first "Prime Minister," and he developed the principle of the joint responsibility of the Cabinet that remains to this day one of the main features of parliamentary government. In the reign of George III even North and Addington were universally acknowledged by the title of Prime Minister, though they had little claim to the independence of action of Walpole or Pitt.

In 1745 a second Jacobite rising took place. Charles Edward, "Bonnie Prince Charlie," was a daring and attractive personality well fitted to lead the Highlanders to victory, and it was a far more formidable affair than the '15. Before the end of the year Charles had inflicted a complete defeat on the English at Prestonpans and had reached Derby. But he was persuaded to retreat and was routed at Culloden (1746) by the Duke of Cumberland, who earned the title of "Butcher" for the horrible cruelty he showed after the battle.

Meanwhile Anson, one of the greatest admirals and naval administrators Great Britain has ever known, had returned from a four years' voyage round the world (1740-1744) to the Admiralty, and the triumphs of the Seven Years' War (1756-1763) were in large measure due to his foresight, clean-handed administration, and the experience gained on his voyage. Because this war saw the foundation of the Dominion of Canada we will leave it till the next chapter.

George III (1760-1820).—In this reign the king once more became an important factor in English politics. He was determined to recover the power of the monarchy, following the advice of his mother, and of Bolingbroke in *The Patriot King*. However, the king found that he could defeat corruption only by using corruption himself. He was driven first to using Bute; then to balancing the Whig parties, using Cumberland as mediator; finally to influencing parties unconstitutionally through the "King's Friends" and private notes of displeasure. As an example of his methods of bribery, he wrote to Lord North (1779), "If the Duke of Northumberland requires some gold pills for the election it would be wrong not to satisfy him."

Yet the House of Commons still attracted the ablest men in the country and never forgot what it owed to popular opinion. Thus it was that William Pitt the Younger, one of England's greatest peace and war administrators, came upon the scene and for nearly twenty years held unbroken office. Had he been in office ten years earlier, the American colonies might never have broken away. As it was, he was able to keep England the one bulwark against the power

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of Napoleon, the one nation in the world which, by its united effort and the stability of its military and economic resources, could stem the tide of French aggression and domination. The revolutionary war, the Napoleonic struggle and the Industrial Revolution all occurred within the limits of this lengthy reign, and all the time the ageing king was on the verge of madness.

A wave of humanitarianism passed over Europe during the reign of George III, typified in England by the Methodist revival of Wesley and Whitefield, by the reform of the law by Bentham and of prisons by Howard. Burke was a typical product of it, for he accused Warren Hastings of maltreating humanity. Later there was a reaction led by Malthus and Ricardo, and the result was the Corn Law of 1815, forbidding importation of corn till the price was 80s. a quarter. This meant dear bread, and riots resulted. In 1819 the Manchester Massacre, which raised such an outcry though only three persons were killed, led to the Six Repressive Acts.

Finally, the most important event in home affairs was the union with Ireland in 1800. In 1798 an Irish rebellion broke out. The chief causes were the land system of oppressive rents, the influence of revolutionary France, the commercial ruin caused by William III's legislation and, as Grattan said, "Ireland can never be free while the Catholic is a slave." At Vinegar Hill the rebels were defeated, and two years later the Union was effected. The four main features were the incorporation of Great Britain and Ireland into the "United Kingdom of Great Britain and Ireland," the establishment of one parliament to contain Irish representatives, Irish contributions to the Treasury and commercial equality.

One of the peculiarities of the cultural movement in the eighteenth century was the deference paid to foreign influences. The Elizabethan era was essentially English. Under the Hanoverians, though constantly at war with France, our taste in letters, architecture and house decoration was to an unusual degree subjected to French and Italian influences. The romantic movements prominent at the end of the century were a return to native traditions and freedom, but even in the heyday of the century the English novel, unhampered by foreign models, had been progressing freely from Defoe (*d.* 1731) through Fielding and Smollett to Jane Austen (*d.* 1817).

In the world of music Handel and Italian opera largely took the place of native forms, but in art, painting gained most and lost least by the close association of society with Continental culture. The age of Reynolds (*d.* 1792), Gainsborough (*d.* 1788) and Romney (*d.* 1802) was the first notable efflorescence of a native pictorial art in Great Britain, and its arrival in time to serve the "great families" was a happy coincidence. Thus was Hanoverian England able, through the greatness of individuals, to overcome the corruption and pettiness of her public life.

LV

THE RISE OF THE BRITISH EMPIRE

The American Colonies.—The discovery of the huge continent of America, thinly inhabited, undeveloped and admirably adapted for European settlement and exploitation, offered opportunities which were unprecedented in human history.

It was as if the peoples of Europe had come into some splendid legacy. But it meant no more to them than a fresh occasion for atrocious disputes. Spain, who claimed first and most, made no better use of her possessions than to bleed herself nearly to death therein. Walter Raleigh aspired to give England "a better Indies than the King of Spain." A small settlement was effected in Virginia, but it was not until the eighteenth century that his dreams found their realization in the foundation of the great commonwealth of British peoples that we know today.

The religious disputes under the Stuarts had the effect of driving out of England a great number of sturdy-minded Protestants who settled in America, and particularly in New England, out of reach, as they supposed, of the king and his taxes. They occupied strips of the Atlantic coastline and found that they were neighboured by the settlements of rival colonizing nations. The Dutch settlements, with the Swedish, soon fell to England, and in 1674 Nieuw Amsterdam became New York. By 1750 British power was established along the east coast, in Newfoundland, and in the north, where the Hudson Bay Company territories had been acquired by treaty from the French. Jamaica and many of the West Indian islands, among Britain's oldest possessions, were acquired from the Spanish over a century earlier.

But France was pursuing a dangerous and alarming game. She had made real settlements in Quebec and Montreal, and at New Orleans in the south, and by treaty with the Indians had pushed up the hinterland behind the British settlements. Many old maps are to be found of this period designed to rouse the British to a sense of the "designs of France" in America.

The war of the Austrian Succession saw the taking of Louisburg (1745)—the Gibraltar of the New World—by the British and of Madras by the French. By the Treaty

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of Aix-la-Chapelle (1748), which ended the war, these were exchanged, but nothing was settled permanently. The rival ambitions of Great Britain and France in America and India had to be adjusted and the sword alone could do that. The French colony in America was sparsely populated, but it was united. The British were in separate governments, thirteen in number, often ill-disposed to one another. After the Treaty of Aix-la-Chapelle, events moved swiftly and the French, by the brilliant conception of a line of forts between north and south, seemed likely to gain a complete ascendancy. In 1754 Fort Duquesne, the last link in the chain, was built and war at once broke out.

The Seven Years' War. — Two years later the Seven Years' War (1756-1763) broke out in Europe. The French, realizing the inferiority of their fleet and the impossibility of conveying an adequate number of troops to America, were making a bold attempt to "win Canada on the plains of Germany." Knowing full well the importance of Hanover to George III they felt that, even if actually beaten in the New World, conquests in Europe would be an irresistible bargaining weapon at the final settlement. It happened that they were defeated in all spheres of action, but not without a titanic struggle.

The Seven Years' War started with the failure of Byng, owing to insufficient support, at Minorca, while attempting to prevent the French fleet from Toulon effecting a junction with that at Brest. Then Pitt came into power and events moved fast and successfully for Britain. His policy, as regards the colonies, was three-fold. In the first place he blockaded the French fleets in their ports while attacking their colonies. He kept the French Army distracted by invasions on the French coast, as, for instance, at Rochefort (1757). This policy raised hostile criticism at home as being merely one for the "breaking of windows with guineas." But it had its effect. Finally, as in the cases of Hawke, Clive and Wolfe, he set aside seniority for merit. In 1759—the *annus mirabilis*—the conquest of Canada was completed when Wolfe, by a bold stroke, scaled the Heights of Abraham and took Quebec, Boscawen defeated the Toulon squadron at Lagos, and Hawke completely destroyed the Brest fleet at Quiberon Bay.

The Indian Empire.—It was not only in America that the French and British interests clashed. The situation in India was a very interesting one. The great Mongol Empire was in a condition of far-advanced decay. The Great Mogul in India, like the Holy Roman Emperor in Germany, was still legally overlord, but he exerted only a nominal authority except in the immediate neighbourhood of his capital.

This was the India into which the French and English were thrusting during the eighteenth century. Ever since Vasco da Gama made his memorable voyage round the Cape of Good Hope to Calicut, a succession of peoples had been fighting for commercial and political footing in India and the East. The Portuguese had wrested the sea-trade of India from the Red Sea Arabs. In the seventeenth century the Dutch had snatched it from their grasp.

By the opening of the eighteenth century both the English and the French were in vigorous competition for trade and privileges with the Dutch. The unscrupulous methods of their rivals and the unsettled state of the country made it inevitable that the powers should arm and fortify their settlements, and this armament made them attractive allies for the native princes who divided India. It was entirely in the spirit of the new European nationalist politics that when the French took one side the British should take the other.

The great English leader was Robert Clive (1725-1774) and his chief antagonist, Dupleix. At Plassey (1757) Clive gained a striking and conclusive victory over the army of Bengal, and by 1761 the British found themselves completely dominant in the Indian peninsula. The Great Mogul, nominally their overlord, became in effect their puppet. They levied taxes over great areas; they exacted indemnities for real or fancied opposition.

The East India Company.—These successes were not gained directly by the forces of the King of England; they were gained by the East India Trading Company, which had been originally, at the time of its incorporation under Queen Elizabeth, no more than a company of sea adventurers. Step by step they had been forced to raise troops and to arm their ships. They had come to buy and sell, and found themselves masters of a sub-continent. No one challenged their proceedings.

In the charter granted to them on the last day of 1600 it had been set forth that "they, at their own adventures, costs and charges . . . might adventure and set forth . . . by way of traffic and merchandise to the East Indies." Is it to be wondered at that these men returned to England with great spoils and knew not what to do? Englishmen were perplexed when presently these generals and officials returned home to make dark accusations against each other of extortions and cruelties. Upon Clive Parliament passed a vote of censure, and he committed suicide or died from an overdose of a narcotic. In 1788 Warren Hastings, a second great Indian administrator, was impeached

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and acquitted.* It was an unprecedented situation—the English Parliament ruling a London trading company which, in its turn, was dominating an Empire far greater and more populous than all the British domains.

The Colonies after 1763.—The Treaty of Paris (1763), which ended the war, saw the fall of France as a colonial power. Great Britain was established as a first-class colonial power and the Indian Empire founded. In India there was little organization. By North's Regulating Act of 1773, some unity of control was secured, but the Bill proved a failure and, a constitutional crisis having been forced by Fox's India Bill, Pitt passed, in 1784, an Act reorganizing Britain's Indian possessions. A governor-general and a board of control were appointed by the king, and the government became directly responsible for Indian policy. Though still under the dual control of the government and the company, affairs remained settled until 1857.

In 1763 Canada was finally ceded to Great Britain, but the western part of the rather indefinite French region of Louisiana, named after Louis XIV, remained outside British control. It was taken over by Spain, recovered by the French in 1800, and finally bought in 1803 by the United States Government. For the time being, the American colonies were settled. Canada, loyal as she always has been, was a difficult problem owing to the numerical superiority of the French. In 1791 Pitt divided Canada into Upper and Lower Canada—French and English—with a controlled representative government. Meanwhile, as we shall see, the thirteen colonies of the eastern seaboard of America, aggravated by misunderstandings on the part of the home Government, drifted farther and farther from the mother country until, twenty years after the Treaty of Paris, the United States of America declared their independence (1776).

Australia.—The early history of Australia is one of discovery rather than settlement.† It was not until 1606, over a century after the discovery of America, that Australia was first sighted, probably by the Spanish admiral, de Torres. In the course of the same century Tasmania was discovered by the Dutch, and the famous English buccaneer, Captain Dampier, sailed to the new continent. But not till 1770, when Captain Cook, after exploring New Zealand, sailed along 2,000 miles of the more fertile eastern coast, were its possibilities for European settlement realized.

Cook had been sent out in 1769 by the Royal Society to make certain astronomical observations which could only be taken in the South Seas. He sailed in a ship named the *Endeavour*. He it was who finally exploded the "Terra Australis" myth by sailing round New Zealand and thoroughly exploring both islands. Landing in New South Wales, Captain Cook gave the name of Botany Bay—where the convict station was afterwards founded*—to the natural harbour where the *Endeavour* anchored, for he found there many strange and interesting plants hitherto unknown to science.

When he returned home, Captain Cook wrote up from the entries in his log an exciting book which was published in 1773. The *Voyages of Captain Cook* immediately became a "best-seller," and the book did much to stimulate interest in Australia and New Zealand. Dampier, too, had written a book about his voyages, but he pictured the country as singularly unattractive and said that the natives were the most unpleasant human beings he had ever met. But his book was forgotten long before Cook's *Voyages* made its appearance. Eighteen years after Cook's exploration—the year before the French Revolution broke out—the first British expedition arrived at Port Jackson and laid the foundation of the colony of New South Wales. The colony, like other colonies, had its initial difficulties; but in 1797 Macarthur, by buying at the Cape some of the Merino sheep that the King of Spain had presented to the Dutch Government, laid the foundation of the gigantic wool industry of Australia. The history of Australia is one of peaceful settlement and penetration. But its record is one of indomitable courage in the face of danger—that courage that has built up the British Empire.

LVI

EUROPE AND THE EFFECTS OF THE GRAND MONARCHY

Grand Monarchy in France.—The death of Louis XIV, with his passion for absolutism, closed a great era in French history. The eighteenth century opens upon a crisis for the monarchy and closes upon its abolition. From 1715 to 1723 came the reaction of the Regency with its marvellous effrontery, innovating spirit and frivolous immorality. For the next twenty years France was well-nigh bankrupt, but was saved by the cautious policy of Cardinal Fleury. The next thirty years saw the personal rule of Louis XV with all the different Powers in conflict, till, at the last, came Louis XVI (1774-1789), with his honest intentions and intellectual impotence, aggravating still further the

* See Chapter LXII.
† See Chapters XLV and LXII.

* The idea was first suggested in 1779.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

accumulated errors of ages, preparing for the inevitable revolution.

It was a part—and a very excellent part—of the function of Grand Monarchy to patronize literature and the sciences. But Louis XV, great-grandson of Louis XIV, was an incompetent imitator of his predecessor's magnificence. Reaction on an extensive scale characterized foreign policy during the Regency. A close alliance between France and her ancient enemies, England and Holland, was maintained from the Triple Alliance (1717) till 1739. All three had an interest in the peace; France, after thirty years' fighting, between two periods of bankruptcy; England, seeing before her the beginning of her empire overseas, and Holland reinstated in her commercial position. Fleury in France and Walpole in England managed to keep Europe for a generation at peace. By the Peace of Belgrade (1739), France put an end to the aims of the Russian Empress Anne and the Emperor Charles VI for the dismemberment of the Turkish Empire and became once more the arbiter of Europe. But the death of Charles VI in 1740 opened up a new series of wars for Europe.

Everyone had signed Charles's Pragmatic Sanction, proclaiming the succession rights of his daughter, the Archduchess Maria Theresa; but on his death there was a general renunciation of signatures and an attempt to divide the heritage which led to the War of the Austrian Succession (1740-1748). Fleury was against breaking his sworn word but, infatuated by Frederick the Great and urged on by Louis's bellicose mistresses, he could resist no longer the drift into war. France joined with Bavaria in an attack on Austria.

Louis was at last his own prime minister, but found the responsibility more embarrassing than pleasing. England, looking on the war as an "Anti-Bourbon" struggle, became Maria Theresa's sole ally. The "disinterested" peace of Aix-la-Chapelle (1748) had no effectual result other than that of destroying the balance of power in Germany for the benefit of Prussia. Meanwhile England had beaten France at sea and the rivalry of the Hundred Years' War had once more sprung up between the two nations.

France had worked for the King of Prussia; now it was to be Maria Theresa's game that was played during the Seven Years' War. Austria's policy was to keep Germany weak; Prussia's policy to make Germany strong. France, visualizing a weak Germany, took Austria's side while England, devoting her energies, as we have already seen, to carrying on a colonial war with France, indirectly helped Prussia.

Meanwhile the monarchy was creeping to its doom. The mistakes of the Government, the prevalence of poverty and want and the successive famines assisted in setting a general fermentation to work. The philosophers only helped to precipitate a movement which they had not created.

Public opinion gradually became vocal, and the whole social and political system of France came under criticism. Attempts were made to suppress free discussion and the publication of hostile pamphlets. There were in France no representative institutions in which grievances could be openly discussed and therefore redress could come in no other way than by violent change.

Louis XVI was not the man to direct or suppress the inevitable revolution. He fell into contradictions and hesitations in internal affairs. In an endeavour to free the kingdom of English supremacy, the revolt of the American colonies provided a heaven-sent opportunity (1775). Secretly aiding them from the start, an open alliance was formed in 1778 and Europe began once more to respect France when in 1779-1780 a Franco-Dutch-Spanish alliance was formed and the capitulation of Yorktown (1781) crowned her efforts with success. But warfare and armaments hastened the "hideous bankruptcy," and Louis, reluctant to abandon one atom of his absolute power, found himself enmeshed in the Revolution.

The Rise of Prussia.—The day of Grand Monarchy was over for France. In Prussia we find the reverse of the medal. The slow rise of the Hohenzollerns found the Prussian kingdom strong enough by the eighteenth century to threaten the Empire. Frederick William I and his son, Frederick II, the Great, were the chief practitioners of Grand Monarchy outside France. The Great Elector, Frederick William of Hohenzollern (1640-1688), may justly be regarded as the founder of Prussian greatness. From 1713 till 1740 reigned Frederick William I, a typical Hohenzollern who carried on the work of the Great Elector. His patriotism ran in the same narrow groove and he left, for good or evil, a heritage that was to flourish later in the German Empire.

In a word, he created that marvellous machine-like discipline in his army which distinguished the modern German troops and on the existence of which the success of their tactical theories largely depended. The army was increased to 90,000 men, perfectly trained and equipped. When he died he bequeathed to his son the strongest army in Europe, and the resources wherewith to maintain and use it. For himself, he was content to hoard and accumulate his men and money. He refused to be drawn into the vortex of northern international affairs.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Frederick the Great, 1740-1786. — In 1740 his son, Frederick II, succeeded this drill-intoxicated king. Lord Acton calls Frederick II "the most consummate genius that in modern times has inherited a throne." Like the Great Elector he was devoid of moral scruple in the means he adopted towards the same end—the consolidation and aggrandizement of his kingdom.

The first five years of his reign afford a pretty example of his methods. The death of Charles VI and the accession of his daughter, Maria Theresa, furnished a glorious chance for a direct act of robbery. Ignoring the fact that Prussia had pledged herself to recognize Maria Theresa's right to the Hapsburg territories, he invaded Silesia, thereby adding "the tail on the map to the Prussian bird of prey."* This was the signal for a concerted attack on Austria, and the coalition being too successful to please Frederick, he concluded a treaty with Maria Theresa by which he definitely secured Silesia. Two months later he joined the unholy alliance against her.

Admitting to his confidence no statesman of independent character, his capacity for work was tremendous. The army was kept efficient down to the smallest detail, and perfect discipline created a most formidable engine of war handled by a commander-in-chief of supreme genius. The machine and the man barely survived the ordeal of the Seven Years' War, a war of revenge in which Maria Theresa succeeded in gathering together a league which isolated Frederick. But thanks to his titanic endeavours Prussia won through. For Frederick it had been a war of self-preservation, not of aggrandizement, and by the Treaty of Paris he retained Silesia. That was all. Most of his remaining acts were concerned with healing the wounds of his stricken country. There remains one stroke of foreign policy to be recorded.

The Partition of Poland.—In 1772, sharing the guilt with Catherine of Russia and the Emperor Joseph II, Frederick achieved the first partition of Poland. Lacking all geographical defences, Poland was exposed on all sides to invasion. For centuries she had played a leading part in the history of Eastern Europe. She had been supreme in the Baltic; in 1683 her heroic king, Sobieski, had saved Vienna from the Turks. But her power lacked sure foundations; her crown was elective; her population was not homogeneous—there were Russians and Lithuanians as well as Poles. Lastly, the country was torn by religious dissensions.

In these circumstances, since greedy and powerful neighbours arose, her absorption was but a matter of time. A strip of this unhappy country still separated Eastern Pomerania from Eastern Prussia. It was a situation much akin to the later problem of the "Polish Corridor." Like the taking of Silesia, the seizure of this strip was an act of barefaced robbery. This partition of Poland was the first step towards her national extinction. It was an unblushing assertion of the doctrine that might is right.

Two subsequent partitions in 1793 and 1795 completed this crime against a sovereign state.

Austria.—The rise of Prussia saw the commencement of the struggle between Austria and Germany for supreme power in "Middle Europe." Austria—the "kingdoms and lands represented in the Reichsrath"—used her power for the good of Europe, since she was the safeguard of the West against the Turk. As yet the diversity of race within the Hapsburg Empire had not made itself felt. Until 1740 her power as overlord of Central Europe had not been challenged. The theft of Silesia changed everything, and the unprovoked assault of Prussia under Frederick the Great may be called the prelude to the struggle which was to end in the banishment of the Hapsburgs from Germany in 1866.

The rivalry with the House of Hohenzollern had begun. Thenceforward the Hapsburgs were torn between two ambitions—the one to maintain the tradition of imperial overlordship in Germany and the west, the other to extend to the south and north-east at the expense of Turkey and Poland. Their eagle emblem faced in both directions. The dismembering of Poland was so profitable a task that the Empire failed to perceive the arrival on the scene of two powerful rivals—Napoleon and Russia.

LVII

FEDERALISM AND THE NEW WORLD

America and England.—Vergennes, the acute French diplomat, had predicted before 1763: "England will soon repent of having removed the only check which could keep her colonies in awe. She will call upon them to help in bearing the burdens they have brought upon her, and they will answer by throwing off all dependence." His prophecy was shortly to come true; it was accurate in every detail.

Nourished in an atmosphere of independence, increased by the policy of *laissez-faire* adopted by the home Government, there had grown up among the American colonists a tradition and practice of self-government far in advance of any established system in the

* Fletcher: *The Germans* (Oxford Pamphlets, 1914).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Old World. Beyond business relations, neither the ministry nor the people at home were particularly interested in the colonial affairs. Out of sight, 3,000 miles across the Atlantic, the colonists were literally out of mind. This attitude, born of ignorance and lack of imagination, goes far to explain why no remedy short of the clash of arms was discovered for divergent views.

The home Government held with justice that the colonists should share a portion of the enormous costs of the Seven Years' War, by which they had gained complete security. The occasion seemed ripe for imposing a direct tax on the thirteen colonies. Statesmanship might have prevented disaster, but Chatham, whose force was now spent, uttered his warnings in vain, and short-lived ministries made a firm and consistent policy impossible. Matters came to a head in 1773, with the famous Boston "tea-party." The prime causes of the breakaway were, first, the Navigation Acts of 1660 which forbade the export of colonial produce to Europe and restricted competition in shipbuilding. High prices in America were due to lack of imports, for there were no ships to build up trade. Secondly, writs of assistance were issued, though condemned in England, to empower customs officers to search houses. Thirdly, ideas of national right were slowly growing up.

The secondary cause was excessive taxation. The Stamp Act (1765), by which legal documents in America were to be stamped, caused riots. Five years later, in a vain endeavour to put an end to grievances, taxes on American imports were repealed with the exception of tea. In 1773 cargoes of tea were to be sold subject to the trifling tax of 3d. a pound. But that 3d. broke up the British Empire. A party at Boston boarded the ships and threw their cargo into the harbour. The "Intolerable Acts" followed, whereby the port of Boston was closed, the constitution of Massachusetts annulled and, by the Quebec Act, the boundaries of Canada defined.

The War of American Independence.— In 1774 Congress virtually severed all connection with the home Government, and open fighting ensued. What were the prospects on either side? At first it seemed that all the advantage was on the side of Britain with her wealth and forces. Yet the advantage was illusory rather than real. Despite British blunders the colonists could hardly have survived the years from 1775 to 1778 without the serene courage and endurance of George Washington (1732-1799). The turning point came in 1777, when General Burgoyne was ordered from Canada to join forces with Howe and was surrounded at Saratoga by Gates and forced to surrender. This led to the entry of France into the war. A half-fought action in the mouth of the Chesapeake (1781) led to the surrender of Cornwallis in Yorktown and the end of all serious fighting on land. A year later, Rodney's great victory at the Saints restored to Britain her lost prestige and control of the sea. But the American colonies were lost beyond retrieval.

The American Constitution. — In May, 1787, a Convention was held at Philadelphia, where a new constitution was drafted. A federal government was set up. In its simplest form this consists in a league or union of two or more states for purposes of trade or defence. Apart from this the states live their own lives, make their own laws and are subject to no outside interference. The modern federal state subjects its citizens to a dual control. The Constitution which created a Federal Republic of the United States established a central government, with a President as its executive head, while the law-making power was vested in Congress. This consisted of a Senate, with two members from each state, and a House of Representatives, to which each state elected members in proportion to population. A Chief Justice, assisted by eight judges appointed for life, presided over a Supreme Court. For local government, each state has a constitution of its own, similar in all respects, but with a Governor in lieu of a President.

This new Constitution created a new form of government. Its success was due to its resolve to build upon a basis of sound democratic principles of human equality and human freedom. The Constitution was wisely hedged around with many safeguards against hasty and ill-considered change.

The United States of America.—For the next thirty years the United States, now a nation, strove to expand and to define its relations with foreign powers. In 1803 the whole of Louisiana was bought from France for fifteen million dollars. Sixteen years later the whole northern shore of the Gulf of Mexico was purchased from Spain, who also admitted American claims in the west, and throughout the first half of the nineteenth century the immigrants marched westward, facing unimaginable hardships as they blazed a trail over the continent.

Meanwhile the question of slavery loomed large. The northern states, whose economic conditions did not require slave labour, were for abolition. The southern states depended on slaves for their stability. Matters came to a head when, feeling political control slipping from their grasp, seven southern states seceded from the Union (1861) and took the title of the Confederates. On the preservation of the Union Abraham Lincoln, the President, took his stand, and civil war was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

inevitable. For four years the country was torn by the struggle, but the North triumphed, and on New Year's Day, 1863, Slave Emancipation was proclaimed. Two years later the defeat of the South was completed by the surrender by Lee of his army at Appomattox Courthouse. The Government had now to apply itself to the gigantic task of reconstruction, but prosperity was rapidly renewed and development and expansion, made possible by scientific inventions, for which America has shown so marked an aptitude, brought in a flood of immigrants.

The closing years of the nineteenth century opened a new era in American history. From isolation from European politics, the United States abandoned their traditional policy and went to war with a European State. Several attempts on the part of Cuba to throw off the yoke of Spain had occurred without success. In 1898 it was clear that nothing short of armed intervention could save the island from ruin, and the United States declared war. The campaign, mainly naval, was short and decisive. The Philippines were annexed and Hawaii occupied as an indispensable coaling station and naval base. By means which were anything but peaceful the "Pacific era," as Theodore Roosevelt called it, was begun.

As a direct consequence of her new position as a world power, the United States was now doubly interested in obtaining control of the Isthmus of Panama. The proposal to cut a canal through the isthmus was not a new one. When American interests reached the Pacific coast, the need for a short and easy connexion between the Atlantic and the Pacific became ever more apparent. The United States lived in constant fear that the enterprise of the British might anticipate them, and in 1850 the Clayton-Bulwer treaty was signed to provide for a canal open to all the nations. Fifty-one years later, by the Hay-Pauncefote treaty, the United States were free to construct a canal. After ten years' work, the canal was opened for traffic in August, 1914.

By the dawn of the twentieth century the United States had abandoned their old ideal of isolation; they had acquired important overseas possessions and had built a great navy to protect them. This development of world power coincided with the birth of more cordial relations with Great Britain, and no serious differences arose with any other European power. The United States readily took part in the Hague Convention of 1899, which established a Permanent Court of Arbitration. In 1900, American troops shared in the rescue of the Pekin legations in the Boxer outbreak. In 1905 the mediation of President Roosevelt brought the Russo-Japanese War to a close.

The United States were at length able to draw on their own resources within their vast and wealthy territories for every want. In their self-sufficiency they stood alone as a great power. They were not impelled to take a part in the scramble for Africa. They did not see why successful business enterprise should lead a nation into a war. They could wear their world power "with a difference."

The Latin-American Republics. — The states which were fashioned out of the wreck of the Spanish and Portuguese Empires all, with the exception of Brazil and Mexico, adopted from the start republican constitutions framed on the most approved principles. Brazil deposed her Emperor (Pedro II) and became a federal republic in 1889; the present Mexican republic dates from 1867.

Those states which are within the tropics have developed more slowly than those in the temperate zones. They have had more experience of revolution and civil war, and have been more submissive to the autocratic rule of adventurers who have established dictatorships. In the restless period after emancipation, there ensued bitter struggles for dominance and for favourable frontiers, and in these conditions the strong man who could command obedience was at a premium. There was little European emigration to the tropical republics, where the greater part of the population consisted of the indigenous Indians and the descendants of negro slaves with Spanish half-bloods (mestizos).

The most rapid development has occurred in the greater republics of Brazil, Mexico, Argentine and Chile. They have avoided for the most part foreign wars and have been sheltered by the Monroe Doctrine. Needing money and labour to develop their natural resources, they borrowed extensively from European countries and encouraged immigration, and in general accepted the current principles of international trade which at that time were based on the conception of free trade. They freely sold their raw materials for industry and their food products to Europe in exchange for railways, machinery and other manufactured goods.

Since the First World War, and particularly since the economic depression of the nineteen-thirties, there has been a change in the direction of a closed economy, a policy aiming at national self-sufficiency promoted by all the known devices of tariffs and controls. The Latin republics became dissatisfied with their rôle in international commerce as producers of "colonial" goods, rendering them helpless victims in periods of trade slumps, when they were forced to destroy their unmarketable surpluses by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

using food as fuel or dumping it into the sea. The trend towards industrialization was greatly accelerated by the Second World War, and the desire of the republics to control their own economic destiny has led to the expropriation of foreign interests in such important undertakings as the Mexican oil-fields and the Argentine railways.

LVIII

THE FRENCH REVOLUTION

THE eighteenth century, culminating in the French Revolution, which was to alter the whole course of politics and economics throughout the world, saw the rise of the spirit of nationalism and the decline of feudalism. Wars gave a new unity to struggling nations, and the spirit of the Napoleonic era was shortly to be infused into the diverse kingdoms that constituted Central Europe. The national element was lacking still in the dynastic struggles of France, the Empire and Frederick the Great. The Grand Monarchy was a spent force. New ideas and ideals were shortly to come into play.

The study of the nineteenth century ought, of right, to begin with the year 1789. "How much the greatest event it is that ever happened in the world and how much the best!" Such was the judgment of Fox when he heard of the fall of the Bastille. Six years after the Treaty of Versailles, which ended the war between Great Britain and France and registered the birth of a new nation, the meeting of the States-General at Versailles heralded the dawn of a new era for France and for the world.

The Causes of the Revolution.—To understand why the revolution broke out in France it is necessary to examine the political, economic and social conditions under the *ancien régime*. The strength of France had grown up as the strength of her kings. The States-General, representative of nobles, clergy and people, which had not been summoned for 175 years, was comparable to the English Parliament of the fourteenth century, in that it was summoned at irregular intervals and stated its grievances with no power of redress. The people of France had, in fact, no effective check on the prerogative of the King.

The French people had many grievances. The whole social system was based on privilege and inequality. Enormous taxes were levied on the peasants by the nobles. The bourgeois, on the whole a rich and educated class, could get no exemption from taxes as the nobles could. They were really responsible for starting the revolution. The nobles were forced to live at Versailles in conditions of great luxury. Consequently they got all they could out of the serfs. Justice was virtually non-existent. By a "Lettre de Cachet," sold by the King, one could detain and imprison one's neighbour on no charge whatsoever.

Although the poorer classes were powerless to protest, and all society was based on inequality, there were many able thinkers and writers, mostly of the middle class, who had long felt the *ancien régime* to be intolerable and did not hesitate to publish their views. The most influential of these were Montesquieu, Voltaire and Rousseau. In his *Social Contract*, Rousseau advocated a return to the state of nature. "Man is born free and yet is everywhere in chains." The remedy is very simple; all powers, privileges and laws which are not the offspring of the people must be swept away by the people, which alone has sovereign power. These ideas of liberty and equality had become familiar during the War of American Independence when, by their intervention, the French had ensured the triumph of a people over their king. In the event the cost of this war hastened the coming of the Revolution, for the actual outbreak in 1789 was due to bankruptcy.

Louis XVI had the very best intentions; he was virtuous and simple; he wished nothing but well for his people. Yet his qualities were negative; he lacked the decision needed in a leader and the imagination to realize how acute had grown the crisis in national affairs. The Austrian birth and reckless extravagance of the Queen soon led to hatred and mistrust. It was felt, too, that her influence with the King was responsible for the frustration of economic reforms. The National Debt increased until the revenue no longer sufficed to meet the needs of the Government. The King was left with no alternative but to summon the States-General.

The first stage of the Revolution. The States-General having assembled, the Third Estate demanded that it should sit with the nobles and clergy as one House, instead of, as formerly, the three Estates sitting and voting apart. Louis XVI yielded, and the National Assembly was formed. Unfortunately, he then took steps to overthrow the new Assembly with his troops and dismissed his Minister, Necker. The Paris mob rose, stormed the Bastille, the symbol of the *ancien régime*, and forced Louis to yield. The Revolution spread to other cities, and on August 4 the clergy and nobles renounced their privileges. The attempt of the King to escape from France (June, 1791) convinced the revolutionaries that he was not to be trusted. A Constitutional Monarchy having been established, the National or, as it was now known, the Constituent,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Assembly was dissolved (September, 1791).

The second stage of the Revolution opened with the meeting of the new Legislative Assembly, composed entirely of men without experience. In April, 1792, France declared war on Austria for refusing to interfere with the "émigrés" who were preparing to attack her from the Rhône valley, and this also involved war with Prussia. At first the Allies were successful, and the King was accused of trying to aid the invaders of France and was suspended.

The third stage of the Revolution now began. The enemy continued to advance and, in panic, the Paris mob broke open the prisons and murdered those suspected of disloyalty to France. The check of the Austrians at Valmy restored confidence, and the National Convention decreed that France should be a Republic. The Girondists, or Moderates, had at first the supremacy in the Convention, but on January 21, 1793, the Mountain, as the Jacobin or extreme Radical party was called, secured the execution of the King and later of the Queen.

Europe was horrified, and the execution led directly to England's entry into the war. The disasters of the French in Belgium led to the appointment of the Revolutionary Tribunal for the punishment of suspected persons, and of the Committee of Public Safety, consisting of nine persons holding supreme power. Meanwhile the Reign of Terror was being carried on. In the provinces the guillotines were found to do their work too slowly, and at Lyons prisoners were shot wholesale; 12,000 victims were accounted for in the provinces alone, for the *ancien régime* must be completely stamped out. The successes of the French armies alone put an end to the Terror, and the Convention regained power. There arose a flame of enthusiasm for France and the Republic; abroad France was to become the protector and helper of all revolutionaries; all the world was to become republican.

The fourth stage was now reached. A Republican constitution was drawn up by which the Directory (an executive body of five members) was established (October, 1795). Until 1799 the Directory ruled France, and then, with a new constitution, *the fifth stage* was reached. Three consuls, of whom Napoleon was one, were appointed, and Napoleon soon made himself supreme. The Treaty of Lunéville (1801), which established a French ascendancy in Europe, marks the close of the Revolution in its international aspects, while the assumption by Napoleon of the title Emperor (1804) marks its close in the domestic history of France.

On October 5, 1795, a mob marched on the Convention, sitting in the Tuileries. It was an attempt, mainly Royalist, to overthrow the Republic before the new constitution could come into force. For the first time since 1789 the Paris mob was cowed by regular troops. Napoleon's swift action in sweeping the crowd with skilfully placed guns was the beginning of the reign of order. The history of the Revolution from this event is merged in the story of Napoleon's rise to power. The romance of the Revolution was ended.

For Europe, the Revolution brought a secular religion—the sovereignty of the people. It is the French Revolution that unlocks the door of modern history. Its principles underlie the political and social evolution of the nineteenth century. With all its extravagance, its unfounded dogmas and its crimes against liberty, its broad ideals possessed a vitality which carried them across the world and inspired countless risings against long-constituted authority. For France and for Europe the Revolution achieved the destruction of the old ways of government.

Progress gained by way of revolution may be a doubtful blessing; your view will depend on your definition of progress; yet it would be hard to deny that the world was well rid of the *ancien régime*, even when dispensed by the most enlightened of despots. The legacy of the Revolution may be summed up in its principles of the rights of man, his liberty, equality and brotherhood. These were not at once realized. As in England the Great Rebellion produced its Cromwell, so in France the Revolution begot the Committee of Public Safety and Napoleon. In England the effect of the Revolution was to postpone all reform and lead to repressive measures designed to prevent any outbreak in that country. It modified the views of the great political parties and raised the hopes of the working classes for the attainment of political freedom. In France it roused a national consciousness and established a military despotism. But the Revolution gave the world the doctrine that government should be of the people, by the people, and for the people, and from that doctrine modern democracy has sprung.

LIX

THE INDUSTRIAL REVOLUTION

For an intelligent grasp of the social, political and economic problems of our own times we must know something of the great changes which revolutionized our national life and society in the eighteenth century—changes which have continued to operate to an increasing extent into our own time.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The great change in man's command over nature and the consequent manner of life which we may conveniently label the "Industrial Revolution" was a process, not an event. It was a change in the technique of industry. Up to the Industrial Revolution, economic and social change, though continuous, had the pace of a slowly moving stream; but in the days of Watt and Stephenson it acquired the momentum of water over a mill-dam. Its effect on the world may be compared with Roman civilization, the Renaissance, or the introduction into mathematics of Arabic figures. It tended to begin in England, for since Sedgemoor (1685) there had been no great battle on English soil and the towns could grow apace unhampered by fortifications. And because it was in England that the great change first manifested itself we will study its course from the English standpoint. England led the way, the remainder of the world followed.

Until the eighteenth century Britain was, on the whole, an agricultural, not a manufacturing, country. Her staple industry had been wool, essentially a domestic industry. The work was done by hand in country cottages, and the old-fashioned methods of spinning-wheels and hand looms were sufficient to supply the needs of the population at home. By the end of the long wars with Louis XIV (1713), Britain had become undisputed mistress of the seas and the volume of her trade and commerce began rapidly to increase. The opening of new markets and the growing demand for goods made it worth while to venture capital in a search for new and more rapid methods of production. Moreover, owing to improvements in medical science the eighteenth century saw a vast increase in the population, and agriculture became even more necessary to support the inhabitants of these islands.

With almost startling suddenness came a series of inventions and discoveries that ended by converting Britain into the workshop of the world. She was helped by her favoured position on the flank of Europe and a wealth of natural harbours available for the ocean trade routes. Further, the compactness of Britain, and the fact that the great iron and coal fields of the North and Midlands lie side by side, enabled her to take full advantage of a long start over Continental competitors.

The Revolution in Agriculture. — In Tudor times the development of the wool trade led to the enclosure of pasture. The process was slow and by 1770 three-fifths of the land was still cultivated under the old open-field system of the Middle Ages. Farmers were slow and ignorant, agricultural implements surprisingly clumsy, but Tull, Townshend and Bakewell were introducing scientific methods into farming. Successful experiments were made in the growing of roots and artificial grasses, in the rotation of crops and in the breeding of cattle and sheep, and it was soon beyond dispute that by the new methods enormously increased profits would be gained by the farmers who had the capital to employ them. The establishment of the Board of Agriculture in 1793 shows the increased interest taken by the Government.

But if new methods were to spread, the open-field system must be abolished, for it was impossible for a man to improve his land or stock if he still held the scattered, unhedged strips allotted him under the old régime. So it came about that in the course of the eighteenth century over 3,000 Enclosure Acts were passed,* which had the broad effect of taking in land which had been common or waste and causing the disappearance of the smallholder. But scientific farming—meat to the wealthy—was poison to the poor man, and the yeoman farmer was forced to sell his land to the big owner and either become a labourer or seek a livelihood in the rapidly growing towns.

Industry and Invention.—As in agriculture scientific methods were changing the face of the country, so in industry an even greater revolution was wrought which brought into being new classes of society, and filled with a dense population whole areas of the North and Midlands which before had been almost unoccupied. For this change two great discoveries were mainly responsible: the use of coal for smelting iron, and the practical application of steam to the working of machinery.

The most important of these inventions were concerned at first with the process of spinning and weaving.† The invention of the fly-shuttle by Kay of Bury (1733) increased both the pace of weaving and the width of cloth. Spinners could hardly supply weavers fast enough, and the next inventions were applied to spinning. Hargreaves's spinning jenny (1763), Arkwright's water-frame (1769) and Crompton's mule (1789), which combined the two, secured far more rapid production of a finer and stronger yarn. It was now possible for the pure cotton cloths and muslins, hitherto imported, to be produced at home. The next step was to apply power to the new machines. The demand for power led to the building of mills beside the running streams in Lancashire and Yorkshire, but though water-power had the merit of cheapness the remote position of the mills rendered transport of goods costly.

It was left for the genius of James Watt

* The General Act was passed in 1800.

† In 1740 there were no cotton mills; in 1815 one hundred million pounds of cotton were manufactured.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to inaugurate the age of steam. He did not invent the steam-engine; his work was to improve and transform the earlier models of Savery and Newcomen—which were first used for pumping water from mines—so as to provide an engine that would wear well and work accurately and economically. By 1774 he had done this, in conjunction with Matthew Boulton, whose workmanship and business aptitude ensured immediate commercial success. Once steam-power was given to the world there was no limit to its application in every branch of industry. By 1781 Boulton could write: "The people of London are all steam-mill mad."* For better or worse the day of the cottage industry and the handicraftsman was over; the centre of gravity must shift from country to town.

The coming of the steam-machine brought an enormous demand for coal and iron. Their juxtaposition enabled Britain to make the most of her inventions. The use of coke and then of coal for the smelting of iron led to the introduction of blast furnaces, and from these it was only a short step to the wholesale output of pig-iron, which up to this time had actually been imported. At nearly the same time came the casting of steel. In 1779 the first iron bridge was built at Broseley (Shropshire) and in 1787 the first iron vessel—a canal barge.

Side by side with the changes wrought by the use of coal and iron and steam came many other notable inventions which all tended to make Britain industrially supreme. The application of chlorine to the process of bleaching effected in a few days what had been the process of months. Bell's machine for cylinder printing is also worthy of note, as further increasing the pace of output in the textile trades. Josiah Wedgwood, designer and maker of pottery, established his famous works at Etruria, Staffordshire, at the same period.

Transport.—With the gigantic volume of trade which now began to develop there came an urgent call for improved communications. Rapid and safe transit was a crying need. The work of scientific road-making had lagged behind strangely in an age of inventive fertility, for although men like Rennie and Telford made a great advance in road and bridge construction, it was not until 1815 that Macadam taught the world the secret of the "permanent way." The problem of transporting heavy goods cheaply was solved by the cutting of canals, a work in which Britain lagged behind the Dutch and French. The father of the movement was James Brindley (1717-1772). His first achievement was the Duke of Bridgwater's canal from Worsley to Manchester which, like most of the older canals, was projected mainly for the carriage of coal.

Results of the Industrial Revolution.—By 1800 the transformation of Britain into the workshop of the world was complete. A few figures will best show what the Industrial Revolution had accomplished in the course of the past half-century. In 1720 Britain's exports were short of £8,000,000; in 1800 they exceeded £34,000,000. The National Debt had increased from £130 millions (during the Seven Years' War) to upwards of £861 millions. Britain's survival notwithstanding that burden and the drain of revenue involved is a measure of the wealth she had amassed.

More significant still was the increase and changed distribution of the population. Up to about 1750 the greater part of the North and Midlands was poor and sparsely populated. The chief centres of population still lay in and round London, in the home and some of the western counties. After 1770 the balance had entirely shifted, and a teeming population of town-dwellers had sprung up in Lancashire, the West Riding, Durham, Northumberland and the Black Country. With this new race there arose a new set of baffling social problems—problems of poverty, problems arising from the displacement of labour, the abuse of free competition, and the yawning gulf fixed between labourer and employer. All these problems were born of the Industrial Revolution, and the twentieth century has yet to discover their final solution.

Britain's industrial greatness was bought at a high price. The factory "hand" found that his freedom was seriously curtailed, and the conditions under which he worked were far from wholesome. The factories were too often unventilated and insanitary, the machinery unfenced, the hours of labour cruelly long and the wages ridiculously low. The remedies were, of necessity, slow in coming. That they were eventually enforced we shall see in another chapter.

New methods in agriculture, new inventions in manufactures, improved means of communications, all had their share in developing the prosperity of Great Britain, and in justifying the name usually applied to this period in her economic history, that of the "Industrial Revolution." The influence of the great wars, however, in developing British commerce, must not be forgotten. "War fosters commerce and commerce fosters war" is the dictum of a distinguished historian; and though this may not apply to the modern world, the saying was true at this time of England, which was never invaded. In every war Britain's imports and exports increased; and, above all, there was an immense extension of her merchant shipping, which

* Steam was first used in a cotton mill at Papplewick, Notts, in 1785.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

was to become, in the nineteenth century, her most important industry.

The development of commerce was particularly striking during the Napoleonic Wars (1793-1815). British shippers had the monopoly of the carrying trade because under no other European flag were goods even moderately safe. British manufacturers were encouraged by the needs of war and by the practical suspension of manufactures in many parts of the Continent. British farmers, secure from foreign competition, obtained high prices for their corn. Great Britain indeed obtained during those years a lead which she was not to lose until other large countries had become industrialized and could compete in the world's markets.

LX

NINETEENTH-CENTURY IDEAS AND IDEALS

NAPOLEON BONAPARTE

In Corsica, in 1769, was born one of the most arresting figures in modern history, the figure of an adventurer and a genius, whose story seems to display the great conflict of vanity and personality with the claims of common good. From his mother he must have inherited his force of character. A strong, managing woman, she had even birched him at the age of sixteen! We have seen how the young Napoleon showed his qualities in dispersing a Paris mob. At the age of twenty-seven he was given command of the Army of Italy, for the French Navy was not yet ready, and their offensive was directed on land against Austria. Defeating army after army, he forced his way to within sixty miles of Vienna and compelled the Austrians to sue for peace. With an inferior and ill-supplied army he struck down the last enemy of France on land in an incredibly short time. This, the first, was in many ways the most brilliant of his campaigns. Profiting by the mistakes of his enemies, who continually divided their forces, he depended on his own rapid movements to defeat them always by striking at their weakest point.

No time could have been more propitious for the advent of a man of military and administrative genius than the years which followed the downfall of Robespierre. France was at war with Austria and Great Britain, the interior vexed with civil strife and brigandage. The State was well-nigh bankrupt, foreign and home trade at a standstill. Throughout the country there was no sense of security. Such was the anarchy created by six years of revolution. And in Napoleon Bonaparte, the Corsican adventurer, France had found a man to save her from herself.

The peace of Campo Formio (1797) which ended the Italian campaign was dictated by Napoleon without reference to the Directory. The Emperor of Austria was to recognize French conquests on the Rhine and in the Netherlands. His Italian provinces, with part of Venetia, were to be formed into a Cisalpine Republic. The Directory dared not quarrel with their general, much as they resented his independent action. To him, indeed, at this time, they owed their continued existence. It was not surprising that men were beginning to look to him as a saviour who could quell the factious strife at home as he had quelled the Austrian armies in the field.

Sense of obligation increased the jealousy of the Directory, who gladly assented to his plan of invading Egypt as a means of striking at British power in the East and restoring to France her lost colonies. But the destruction of the French fleet by Nelson at the Battle of the Nile (1798) dissipated his hopes and he returned empty-handed to France. The nation was sorely in need of a head and a sword, and Napoleon was determined to provide both. By a *coup d'état* (1799) he overthrew the government, and the Consulate, which ruled for five years, was carefully designed to disguise the fact that the First Consul (he was one of three) was invested with autocratic powers.

After a second campaign in Italy, the signature of the Treaty of Amiens (1802) gave the Consul a short breathing space to turn his mind to the resettlement of

Napoleon I, Emperor of the French

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

France. It is this constructive side of Napoleon's genius which survives to this day. His first measure was to ensure that his power would be felt throughout all the land by his direct appointment of all local officials. The centralization which the revolutionaries had sought to destroy was re-established. Finances were restored on a business-like basis, the credit of the country being largely renewed by the creation of the Bank of France in 1800. The judicial system was likewise reorganized. In all these reforms he employed men of talent regardless of their past political record. Next he set himself to heal the quarrel with the Church, recognizing that civil war in France had been caused by the persecution of the old religion and clergy, and by the wild attempts of the revolutionaries to abolish all forms of worship. He saw the necessity of religion and he restored it not merely for its own sake but as an invaluable factor towards his own aggrandizement. The Concordat (1801) with the Pope recognized the Roman faith in France. But the State was to nominate the bishops and pay the clergy, and the confiscated Church lands were not to be restored.

Greatest, perhaps, of all his work was the issue of the Civil Code of Law, known later as the *Code Napoléon*. By this the complex and often obsolete laws and customs were reduced to a single system representative of the new society born of the Revolution. The work was done by a committee of experts over which Napoleon often presided. This code remains the basis of modern French law, and has had a wide influence on the Continent and America. In public works and in education, Napoleon showed equal energy and foresight.

But the Peace of Amiens could not last, for Napoleon had not fulfilled his promise to withdraw from the Netherlands, and Britain refused to evacuate Malta. For the third time Napoleon set himself to overthrow the sea-power of Britain. An elaborate campaign was arranged, including plans for an invasion of England on a vast scale. The Battle of Trafalgar (1805) destroyed in one blow all his hopes, but for ten more years war ravaged the plains of central Europe. In the midst of his invasion scheme Napoleon was crowned Emperor of the French (1804). "I found the crown of France lying on the ground," he said, "and I picked it up with my sword." For eleven years he never ceased to wield that sword.

One by one the enemies of France fell before the genius who had rescued the country from the edge of the abyss of ruin. Prussia and Austria, subsidized by Britain, were ruthlessly thrown from his path at Austerlitz (1805) and Jena (1806). "Roll up that map," exclaimed the dying Pitt when he heard the news, "it will not be wanted these ten years." Britain remained alone the bulwark of the old civilization against the upstart monarch, and Britain it was that brought about his downfall.

Aided by unhampered power at sea and by the national spirit of the Portuguese and Spaniards, Wellington drove the French from Spain. It was a long and evenly matched campaign, but the French marshals learnt to value the quality of the British troops. The "Spanish Ulcer" was a steady drain on the resources of Napoleon, and for once he was tested and found wanting. Unwilling to go to Spain himself, he refused to hand over the direction of the war to another. From Paris he issued his orders. Dispatches took three weeks to reach Madrid; small wonder that his plans went constantly astray. The Moscow expedition (1812) hastened his downfall. Considered as a single campaign it was the most colossal disaster in modern history. In the retreat men fell by the wayside in their thousands. It was the beginning of the end. The war of liberation had begun and, hemmed in by a united Europe, Napoleon was forced to surrender after Waterloo (1815).

Napoleon would have the States of Europe revolve like planets round the glorious sun of France, dependent for their light and life upon her rays. The ambitious dream of world conquest did not endure, since he reckoned without the factor of sea-power, which he never fully understood, and without the factor of that national spirit which he aroused but could not lay. Thus, in the end it proved that for all his consummate skill his military domination was temporary, while his work of reconstruction for France was lasting. In every department of civil and military administration his intellectual power was outstanding. No man, perhaps, ever had so great a belief in himself. The dazzling successes which he gained early in life partially account for his final failure, for they led to supreme self-confidence, lack of scruple, over-ambition and the running of unjustifiable risks. It is hard to believe Napoleon's statements, made in exile at St. Helena, that he professed liberal doctrines of government, the rights of small nations and love of peace!

The consequences of Napoleon's bid for world supremacy were seen throughout the nineteenth century, in the unification of Germany and Italy which he had himself done so much during his lifetime to promote. That he should have begun the work which Bismarck completed is one of the strangest ironies of history. And yet, it may be (except in France), the abiding results of his career and work have not been those which he deliberately designed. The struggle against his despotism brought to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

birth the spirit of nationality which, with the growth of democracy, will be seen to underlie all the important movements of the nineteenth century.

LXI

INDUSTRIALISM AND THE NEW POLITICAL THOUGHT

The Workers and Laissez-faire.—The Industrial Revolution of the eighteenth century not only led to the political revolution which during the nineteenth century established democracy in Great Britain, but it also helped to bring about a social and economic revolution.

No great change can be accomplished without far-reaching effects on every other branch of life, and the Industrial Revolution was no exception to this universal rule. That remedies were long delayed was due largely to the fashionable theory of non-interference by the State, a theory enunciated, though with many qualifications, by Adam Smith in his *Wealth of Nations* (1776). Lesser and more dogmatic writers who followed him projected his views into a hard and fast theory that all Government interference was vicious. It was not then surprising that employers of labour should believe that Factory Acts and restriction of working hours in relief of women and children were not only useless but mischievous, as tending to destroy the prosperity of the nation.

The worker had no power whatever to make a bargain or to resist oppressive terms; to refuse the master's offer was to starve. So he accepted the terms offered; he worked for twelve or fourteen hours a day under the most unhealthy conditions, and his wife and children did the same. Of home life and education there was none. Disease, vice and crime were almost universal. The working classes had no representatives in Parliament. They were dumb before their shearers, and the fear of revolution at home during the life-and-death struggle with France blinded the eyes of the governing classes to the rights of man. A new society had come into being, and the framework of the old Government was not wide enough to include it, or even to legislate for it. The newly created towns were entirely unrepresented; the new working class had no stake in the country.

After the great wars which ended in 1815, the cry for reform of Parliament grew insistent, and more insistent still was the cry for social reform—for improved conditions of life and labour. Between 1815 and 1832 political and industrial unrest led to continual riots. The trouble was aggravated by the inevitable slump, for Britain, the workshop of the world, found that the Continent was now able, in peace time, to set up her own manufactories. The working classes had to wait a long time yet before they received power of themselves to help themselves. The Reform Bill of 1832, passed after a fierce struggle, gave votes to the middle class; the working men in the towns got no votes until 1867, while the country labourers had to wait until 1884. Till then their prospect of relief depended largely on the single-hearted and public-spirited efforts of individual philanthropists.

The first step towards improvement was the passing of the new Poor Law Amendment Act (1834). Outdoor relief to the able-bodied was abolished, and workhouses were built by parishes grouped into Unions. The Poor Law was administered in each Union by an elective Board of Guardians, who granted relief only to paupers who were willing to enter the workhouse. By this means the pauperization which was ruining the country began steadily to diminish. About the same time the first Factory Act (1833) for which Lord Ashley (afterwards Shaftesbury) was responsible, came into operation. It went far to regulate the hours and conditions of the workers, and Government inspectors were appointed to enforce the law. Meanwhile the Combination Acts, which had forbidden workmen to unite or strike for better conditions, had been swept away by 1824-1825. The rise of the Trade Unions, which was not brought about until the end of the century, was now made practicable.

Humanitarianism.—Everywhere in the first forty years of the nineteenth century we find humanitarian movements. The work of Wilberforce and Clarkson for the emancipation of slaves, the improvement in prisons already wrought by John Howard, and continued by Elizabeth Fry, are perhaps the most conspicuous examples. Romilly laboured unceasingly for the reform of the savage criminal code by which women were flogged and children put to death. In 1800 death was still the penalty for over two hundred "crimes." With Catholic emancipation in 1829, religious toleration was becoming more of a reality, while religious instruction in Sunday schools was promoted by Raikes and Hannah More.

In their own way the great philanthropists saved their country as surely as did any other class. Nor could their work have been so well supported but for the previous influence of John Wesley (1703-1791), the most remarkable personality in a century that produced such a wealth of distinguished men. He was the pioneer of the evangelical revival which produced

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nothing short of a religious revolution. This spiritual revival, with its reminder that in Christian charity man is concerned with the welfare of his brethren, was the antidote to the poison of material selfishness instilled by the doctrine of *laissez-faire*. The fierce revolutionary enthusiasm which in France was debased into irreligion, anarchy and crime, was in England largely diverted into these religious and humanitarian channels.

Education.—The second half of the nineteenth century was a period of rapid advance in popular education throughout all the Westernized world. Scotland had possessed a national system of education since 1696, but in England education was left for nearly two hundred years to the care of individuals. Government grants were made, but in 1865 Gladstone, the Chancellor of the Exchequer, was pledged to economy, and the grant fell to £635,000. In 1870 the first Education Bill remedied these defects, and six years later an Act was passed providing indirect facilities for making education compulsory. In 1891 fees in elementary schools were abolished. For the sake of greater efficiency and to encourage secondary education the Act of 1902 entrusted the county councils with the administration of popular education. Since then further progress has been made by the Education Acts of 1918 and 1943, both of which were passed through Parliament in time of war. The latter raised the school-leaving age to 15.

Robert Owen and Socialism.—Finally the Industrial Revolution brought forward a creed of practical socialism. Robert Owen, the founder of the movement, was a "paternalist." He was sternly opposed to the system of *laissez-faire*, but he was not a "socialist" in our modern conception of the term. He largely influenced the development of trade unionism and co-operation, but his ideas were too crude and nebulous to be adopted in their entirety, and his Utopianism was eventually abandoned for a less ambitious and more practical series of reforms. English Socialism developed along the peaceful lines of the Rochdale pioneers who opened their first co-operative store in 1844.

Industrialism created a demand for a new outlook in politics. By introducing an era of rapid communications it enabled the defects of the new system to be brought before those humane-minded persons who were willing and eager to devote their lives to securing alleviation of misery for their fellow men. A new political creed was born, admirably suited to the demands of the new order. The coming of socialism was slow but inevitable, and the working classes justly took their place in the governments of the world.

LXII

THE BRITISH COMMONWEALTH OF NATIONS

England and Her Colonies.—In a survey of the period between the fall of Napoleon and the close of the nineteenth century two facts emerge: first, that a British army appeared only once to fight on European battlefields (during the Crimean War); secondly, that extra-European wars persistently occurred where British armies and fleets were called, in the cause of Empire, to fight in nearly every part of the world. The conclusion that we inevitably draw from this fact is that whenever Britain's relations with a European power were strained, the source of the trouble could always be traced to her concern for the safety of her overseas dominions. Thus, her consistent support of Turkey against the advance of Russia was prompted by fears for the safety of India. Britain was on the brink of war with France over the partition of Africa and the administration of Egypt.

The greater portion of the history of the nineteenth century is concerned with the assertion of two great principles—the right of a nation to rule itself without foreign interference, and the right of the people within that nation to share in their own government. When we turn from European politics to the growth of the British Empire, we find the same principles apply with equal force. They are principles which lie at the root of the British constitution. While Britain looked with warm sympathy on the struggle of rising nationalities and the growth of liberal ideas in Europe, she had no quixotic desire to enter the lists as champion of the oppressed. She had work enough to do in the administration of her overseas empire.

Since the unhappy revolt of the American colonies, the imperial responsibilities of Great Britain have been exercised according to wiser and more liberal principles. She learnt her lesson and her task has been to educate, to emancipate and, by her example, to insist that the possession of rights implies the fulfilment of duties. When a British subject is asked upon what system the success of Britain's empire-building depends, he may truthfully say that it has been due in the main to want of system. There has been no iron uniformity such as the Prussians enforced in Poland or in Africa, but flexibility and instinctive mistrust of written constitutions and rigid, soulless routine.

India.—The assumption of a closer interest in India by the British Parliament coincides with the career of Warren Hastings. No man did greater work in the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

face of such appalling difficulties. Not only did he have to face the bitterest open hostility of his own council, but the whole weight of a series of wars was laid upon his shoulders. The French did all in their power to help Britain's foes, but in India she lost not one inch of territory. That was the record of Hastings, which entitles him to rank as the greatest of the great Englishmen who founded the Indian Empire. By the end of the Napoleonic Wars the power of the Mahrattas, armed robbers who swept over middle India, had been broken, and the British were enabled for a time to turn their whole attention to the reconstruction of the new empire. Briefly, Britain's ideal was to retain all that was best in Indian law, custom and religion while introducing such a measure of Western education as would in the end fit India for self-government. India was in truth to be held in trust.

The next forty years were spent in organization and in further annexations, such as that of the Punjab (1849), creating a strong "buffer" against the inroads of the Afghans in the north-west. Meanwhile the East India Company still lived on, reigning but not governing, until the Mutiny put an end to its existence.

The Mutiny (1857), like most revolutions, was due to a number of causes. It came suddenly and its magnitude was unforeseen. Yet on the whole it was a military rather than a national rising, for India was not a nation. The outbreak was due far more to over-hasty reforms than to a wave of fanaticism. It was a salutary warning that with the best intentions and excess of zeal a Western reformer can dangerously unsettle the life of an Oriental people. By the end of 1857 the worst was over, and by the following June tranquillity was restored except in a few isolated regions. Thereafter, in the matter of defence against threats to India's security Britain's chief concern was for the North-West Frontier in the face of a Russian advance, and this concern led her once more into war with the Afghans, but by the end of the century improved relations with Russia secured a complete understanding (1907).

The Mutiny swept the Indian sky clear of many clouds. With justice it has been described as "reactionary in its causes and revolutionary in its effects"; it cleared the air for reconstruction and improvement. By an Act of Parliament (1858) "for the better government of India," the direct government was transferred to the Crown.

Canada.—We turn from India to a unique product of the British Empire—the self-governing colony. The problem before Great Britain in the nineteenth century was a difficult one. How was it possible for a colony to be a daughter in her mother's house and a mistress in her own? To British statesmen of all parties these two objects appeared, in the words of the Duke of Wellington, "completely incompatible." In Canada, however, a solution was at last achieved.

As we have seen, Canada, by an Act of 1791, was divided into two parts, each possessing a governor, a legislative council nominated by the governor, and an elected assembly. Soon after 1815 discontent began to develop with this form of government. The situation was aggravated by the fact that in Upper Canada the offices of state had become the monopoly of a few families, whilst in Lower Canada there was constant friction between the French and British colonists. Discontent came to a head in 1837, just after Queen Victoria's accession. Small rebellions were put down without much difficulty, but the country was full of unrest, and it seemed, in the words of Peel, that "another Ireland might grow up in every colony." Many British statesmen of this time regarded the colonies as costly encumbrances to be quickly got rid of.

In 1838, Lord Durham was sent with full powers to deal with the situation. In his report he advocated, first, the grant to the colonial assembly of full control of nearly all internal affairs; and, secondly, the union of the two provinces. The union was effected (1841) and a new constitution drawn up. In 1867 the two provinces were federated and the Dominion of Canada created. Gradually the great territories of the north and west were added. By 1905 the Dominion as we know it today was complete, and development was able to proceed unhampered by political disputes.

Australia.—Meanwhile the colonies of Australia were gradually being formed out of the original territories of New South Wales, and in the reign of William IV, as its capital, Adelaide, suggests, South Australia was founded and Victoria, whose capital, Melbourne, fitly perpetuates the connexion of the Queen and her first Prime Minister, became a separate colony in 1851. Eight years later Queensland followed suit. In 1900 the various provinces were federated together and became the Commonwealth of Australia. The two islands of New Zealand were annexed by Britain in 1840, but for a time there were severe hostilities with the native Maoris, who fought cleverly and bravely behind their fortified stockades. But the country prospered as a British colony and in 1855 it was granted a large measure of self-government. Fifty years later it became the Dominion of New Zealand. In their government and policy the colonies of the great sub-continent and Oceania are perhaps the most democratic of the British Empire.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Africa.—The history of British dominion in Africa is more chequered than elsewhere. In South Africa the predominant question has always been one of Boer or Briton. The rugged and obstinate Boer farmer, of Dutch Protestant stock, had little in common with the eager sympathies, progressive ideas and somewhat ignorant sentimentality which characterized a large portion of the British public in the nineteenth century. It was the native question which first produced friction between Boer and Briton. In 1833 the British abolished slavery in the dominions, the direct result of the humanitarian sentiments of the century. But what rankled equally in the mind of the Boer was the conferment, five years previously, of rights to security of property and person upon the native races of the Cape. In this difference of view, besides smaller grievances, was found the motive for the Great Trek (1836), when a large proportion of the Boer population left Cape Colony and went north and east to seek some place where they would be left in peace.

In 1877 the Transvaal was annexed, an annexation which had two results. In the first place it angered the Zulus, who bordered on the Transvaal, and led to the Zulu War (1879). The second result was a rising of the Transvaal Boers and the first Boer War (1881). Under-estimating the fighting capacity of the Boers, the British sustained several defeats and the crowning disaster at Majuba. But the Government of Gladstone continued to negotiate for a settlement, and in 1881 Boer independence was recognized. The trouble was not yet at an end, and the South African War (1899-1902) was yet to come. Britain was the most unpopular nation in the world, but though Europe watched events with keen and hostile interest no other Power joined the Boers and, to the surprise of the world, the war ended in Britain's favour. For three years Lord Milner supervised the reconstruction of the colonies and in 1906, only four years after the close of the war, full self-government was granted—an experiment which, though rash, has been wonderfully justified by its success.

LXIII

THE RISE OF NATIONALISM

The Congress of Vienna.—The Congress of Vienna met in 1815 to reconstruct the map of Europe and to establish permanent peace in the world after twenty-three years of war. Every great peace conference builds with a view to permanence, but the result of their labour has been too often a sad example of the vanity of human wishes. Unfortunately the majority of the members of the Congress of Vienna had learned nothing and forgotten nothing. What they chiefly desired was to forget the existence of the French Revolution and Napoleon and return to the old world of absolute kings and class privileges. They refused to recognize the two great principles evoked respectively by the Revolution and Napoleon, namely the freedom of individual man and the freedom of individual states.

In order to isolate France and preserve that balance of power in Europe which has always been the aim of British statesmen abroad, Belgium was forced into an unnatural union with Holland, differences of race, language and religion being ignored. Naturally the Belgians revolted (1830) and a year later the Conference of London recognized their independence and created the Belgian kingdom. Similarly Norway was detached from Denmark and annexed to Sweden in recognition of services rendered to the Allies in the Wars of Liberation. This forced union was typical of the work of the Congress in its disregard for national sentiment. Peace and prosperity continued, but Norway chafed more and more. It was galling to national pride to see Norwegian interests represented abroad by Swedish officials. An agitation began for the abolition of the office of Stadtholder (the king's lieutenant in Norway), and in 1905 the Norwegian Parliament declared the union dissolved. All possible concessions were offered by Sweden and were steadfastly refused, and feeling ran so high that war was narrowly averted. Fortunately, however, an agreement was arrived at, satisfactory to both nations.

The Making of Germany.—It is to Prussia and Italy that we must look to see the major effects of the rise of this feeling of nationalism that Napoleon did so much, unwittingly, to instil into the nations of the civilized world. In 1815 the term "Germany" meant anything or nothing; it included Austria and did not include East Prussia. It was a bundle of thirty-nine states very loosely connected. At best it was only a union of princes, not of peoples, and of the princes the houses of Hohenzollern and Hapsburg were animated by violent jealousy.

The rapid advance of Prussia to the position of a first-class Power was due to the sharpness of her sword. "Prussia is not a country which has an army, but an army which has a country." The years of adversity from 1807 to 1813 had evoked a spirit of patriotic revival. In spite of Napoleon's grinding tyranny, and fired by the example of Fichte's Addresses to the German People, a group of remarkable statesmen, soldiers and administrators brought about an amazing revival. The Congress of Vienna did not advance the prospect of a united

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

German nation, but the ideal was not forgotten. The most important question for the future to decide was the relation between the two first-rate Powers — Austria and Prussia. Only by the effort of one great state could the thirty-eight others be brought into a close union. Conscious of her power, Prussia now resolved that Austria should no longer claim suzerainty over the smaller states on the strength of an imperial authority no longer justified by material force. The problem of ultimate unification was no nearer solution when the great revolutions of 1848 took place. In nearly every state of Europe the cry for freedom went up. The Liberal Party "took charge" and forced a democratic constitution upon their demoralized princes.

The revolutionary wave spread through Germany, and in 1848 representatives of all the German States met at Frankfort and after a long disputation framed a new constitution. Germany was to become an hereditary empire with two houses of parliament. The Imperial Crown was offered to Frederick William IV, the King of Prussia. Here was the parting of the ways. Were the Hohenzollerns to forsake the absolutist tradition of their ancestors and bow to the decrees of a federal and democratic council? For the last time with effect the Austrian influence helped to turn the scale and the king declined the offer as derogatory to his royal dignity.

In 1861 William I succeeded to the throne and found in Bismarck an adviser well versed in the problems of internal policy, and qualified by experience to plumb the depths of European diplomacy. Despairing of convincing a Liberal parliament of the need for army reform, William, after some misgiving, appointed Bismarck minister-president in 1862. In seven years the German Empire was created by three successful wars waged by Prussia. The first war arose out of the long-standing and complicated dispute as to the possession of the provinces of Schleswig and Holstein. Waged in alliance with Austria, Bismarck was resolved to make its issue a plausible pretext for a breach with the latter Power, and in this he was entirely successful. The war of 1864 made possible the naval ambitions of the Germans, for Bismarck grasped the strategic importance of Kiel Harbour and the canal which would open the door to the North Sea. Friction with Austria soon arose over the Duchies of Schleswig and Holstein and in 1866, after the brief campaigns of the "Six Weeks' War," a triumph for Prussian discipline, Prussian unity was complete, and the yoke of Austria thrown off once and for all.

Following a successful war with France, largely the consequence of Napoleon III's inept foreign policy and attempt to interfere in Central European affairs, German unity was a *fait accompli*. On January 18, 1871, William I of Prussia was proclaimed German Emperor at Versailles.

The Liberation of Italy.—We have seen that 1870 was the birth-year of a great European Empire. In that same year "Italy," which, like "Germany," had been for centuries a mere geographical expression, became a united kingdom. The destiny of a nation still depends in large measure on its geographical position. When we turn to the map of Italy we find certain physical features which help to explain why she attained her unity so late in time. In the north the great mountain masses of the Alps form, indeed, a natural frontier, but they are not, like the Pyrenees, impassable save at either extremity. Again, the peninsula is long and narrow, and the spine formed by the Apennines makes for separation of small states rather than for unity. Living on past glories and the magic of a name is hungry work, especially before the days of Cook's Tours and the American almighty dollar. Italy was poor, beautiful and defenceless, because the members of her household spent in jealous bickering the energy they should have devoted to the repairing of her castle walls.

What sowed the seeds of patriotism and raised a harvest of devotion to an ideal of unity from such unpromising soil? Napoleon was hailed as a liberator when he entered Milan in 1796, and eight years later he established his Kingdom of Italy. As the revolutionists would "force men to be free," so Napoleon, by a strange irony, evoked that invincible spirit of nationality which in the end destroyed him.

When his empire fell the old patchwork plan of the eighteenth century was restored by the framers of the Congress of Vienna. But the spirit of liberty lived through all persecution. For fifty-six heroic years the fight for unity and freedom was maintained, till in 1870 the King of Italy entered Rome, his natural capital. Rome, venerable storehouse of mighty traditions, became the first city of the youngest nation.

The making of Italy was the life work of four men. It is great crises that generally produce great men, whether soldiers or statesmen.

> "We think of those
> Who blew the breath of life into her frame:
> Cavour, Mazzini, Garibaldi; Three:
> Her Brain, her Soul, her Sword, and set her free
> From ruinous discords with one lustrous aim."

The list is incomplete without the name of her most gallant king, Victor Emmanuel.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

By the formation of the Association of Young Italy Mazzini showed the inspiration and the power to unite the strength of the elements that were striving blindly for unification in his country. The "Year of Revolutions" (1848) saw an Italian bid for unity that was crushed with frightful severity. In the north, Austria restored peace by dint of brutal floggings and numerous executions. In Naples and Sicily was established a reign of terror described by Gladstone as "the negation of God erected into a system of government."

In 1855 Cavour undertook the bold step of sending 17,000 Piedmontese and Sardinian troops to assist the Allies in the Crimean War. He thus secured the friendship of Britain and France, the latter proving invaluable in the conflict of 1859 with Austria. Just at the moment when Austria was faced with complete defeat the French decided that they had done enough, and the Peace of Villa Franca was concluded. Cavour realized that henceforward Italy must do her own work.

Gradually, by the heroic and romantic efforts of Garibaldi and his small but loyal force, the Piedmontese and Sardinians carried everything before them, and Naples fell. In 1861 Victor Emmanuel assumed the title of King of Italy. The Prussian alliance of 1866 joined Venice to the kingdom, and the Roman question alone remained unsolved. In 1867, for the second time, Garibaldi and his troops attempted to enter Rome, but they were once more unsuccessful. Three years later, however, on the withdrawal of the French garrison at the outbreak of the Franco-Prussian War, the Italian Army entered Rome. United Italy had at last risen to her feet; she had now to learn how to walk alone.

Austria and Hungary.—By the settlement of 1815 the Hapsburg dominions in Central Europe kept the mark of compactness that Napoleon had impressed upon them. The loss of the Netherlands was a positive gain in so far as their maintenance had always involved great expense of men and money. For the first half of the nineteenth century the problem of keeping Magyar, Italian and Slav nationalities in subjection was tackled by Metternich (1773-1859), who stood as the champion of despotic rule. His system did not prove strong enough to destroy the democratic spirit born of the French Revolution, and the year 1848, which stands as a signpost pointing the new road to Democracy and National Freedom from the barren land of Repression, marked the flight of Metternich and the downfall of his system.

From 1866 onwards "Austria" was absorbed in racial problems, and sought a partial solution in a new liberal policy of expansion in the Balkans. Distraught by the defeats of 1866 and threatened with the dissolution of his empire, Francis Joseph had no alternative but to come to a peaceful understanding with the most powerful and dangerous element of his subject states. He accepted an arrangement generally known as the Compromise, and Austria and Hungary became equal and entirely separate states. The only links between them were the monarch, two or three joint ministries and "delegations," or bodies representing the Austrian Parliament and the Hungarian Diet, which met twice a year, alternately in Vienna and Budapest. The Hapsburg Empire had become a dual monarchy.

The Compromise was fraught with the most important consequences, for it placed the German and Magyar races on a pedestal from which they surveyed the remaining nationalities almost with contempt, and the Magyars in particular now began a systematic policy of repression. The Dual Monarchy produced a general negative quality—the denial of democratic self-control and equal rights to the Slav and Latin nationalities. In a dawning era of democracy and freedom, when every race was striving for the recognition of its nationality, the Dual Monarchy was a blatant anachronism.

LXIV

THE FAR EAST

China and Japan.—The ambition which had carried the Trans-Siberian Railway six thousand miles across a continent brought Russia into close contact with China and Japan. Predominance in the Pacific could not be won without the consent, passive or enforced, of these two Powers. China was already persuaded that submission to peaceful penetration was her best guarantee against dismemberment by other rapacious "foreign devils." Throughout the nineteenth century China was the sick man of the Far East. It had always been her pride and ambition to keep herself apart from all other nations. The Chinese, essentially a pacific race, asked only to be left alone, but the Western nations forced themselves upon her with a view to enriching themselves by opening and developing markets.

China affords the classic example of a country which has attained a high degree of culture at a very early date, but has known no continuous progress. Her religion and ideals point to conservatism, and foreign influences have made little or no impression on the mass of her people. By the Treaty of Nanking, which ended the Opium War with Britain (1840-42), five ports were opened to foreign trade and Hong Kong was ceded to Britain. Strangely contrasted with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the inertia of China was the amazing activity of her neighbour, the island empire of Japan.

There is no precedent in history for the marvellous transformation by which, in the space of a few years, Japan advanced from a state of isolated feudalism to the condition, political and military, of a Western European State. In 1853-54 an American fleet under Commodore Perry forced the Japanese to open up their country to American penetration and influence. The Japanese, for their part, absorbed the new ideas with disconcerting readiness. The Chinese Government viewed with disgust the creation of the new Japan, and sharp contention soon arose over the administration of Korea. China, which claimed the suzerainty, resented and obstructed all the efforts made by Japan to induce the Koreans, a listless people demoralized by centuries of misrule, to reform themselves. When Japan introduced a wide programme of reforms in Korea, war followed with China (1894). All that Japan now gained was counted as loss by Russia. Port Arthur she had counted as her own and, professing anxiety for the integrity of China, Russia, Germany and France forced Japan to surrender the Liao-Tung Peninsula.

The intensity of anti-foreign sentiment in China encouraged by various circumstances was seen in the outbreak of the Boxer Rebellion (1900), a savage crusade against all westernizing reforms. A year later China signed a peace by which she paid a huge indemnity and undertook to dismantle the forts round Pekin. In return the Powers guaranteed her integrity.

In 1902 Japan strengthened her position by concluding an alliance with Great Britain which ensured that the coming war would be fought without interference by other sea Powers. The alliance was most useful to Britain in that it safeguarded her commercial position in the Far East and enabled her to concentrate her strength in European waters. The policy of Russia hastened the day of reckoning. She made no secret of her intention to dominate the Far East, and so far from respecting the integrity of China, maintained a large force in Manchuria and refused to evacuate it, though pledged by treaty to do so. When she trespassed on Korean territory war was inevitable. In 1904 the Japanese, without declaring war, torpedoed Russian warships in Port Arthur and landed troops in Korea. From the outset Japan took the offensive and the war was a model in the effectiveness of sea power. The annihilation of the Russian fleet hastened negotiations for peace, and in September, 1905, the Peace of Portsmouth (U.S.A.) was concluded.

The meteoric rise of Japan to the status of a world Power was effected almost in spite of herself. Japan was mistress of the Far East. The day was to come when her new ambitions would prove sorely embarrassing.

LXV

THE AGE OF REALISM—IMPERIALISM

The Development of German World-Policy.—We have seen how Bismarck created the German Empire by three successful wars. He provided for its safety by the formation of the Triple Alliance (with Italy and Austria-Hungary) and a defensive agreement with Russia. Germany he regarded as a "satiated state" whose great need was peace. His views were not unlike those of Colbert in 1670 when Louis XIV stood at the parting of the ways, one of which pointed to peaceful expansion by trade, industry and agriculture, and the other to the military aggression which so fatally attracted him. So it was when William II succeeded his father in 1888. He was not satisfied with the power he possessed nor yet that it should be increased by peaceful means. Many people thought that nothing short of world-supremacy would appease his voracious appetite.

When Germany turned to her new policy she found that nearly all the best of the world's empty spaces were already occupied. Germany was fast becoming a nation of shopkeepers, and if a shopkeeper is not merely to keep his doors open, but to enlarge his premises and increase his staff, he needs ever-increasing customers and wares. The need for new markets after Protection was adopted in 1879 was imperative. Bismarck did not incline to a forward commercial policy. He was most at ease in the European theatre. It was for William II to play a part on the world stage. The Kaiser had a choice of two policies. One was to expand by the peaceful operations of commerce, backed by unexampled progress in science and technology. The other was by means of an aggressive "Welt-Politik," backed by a nation trained to arms, and now dreaming of the creation of a fleet strong enough to challenge British naval supremacy.

The new colonies did not flourish; they were a doubtful blessing and a certain source of expense, and they could not solve the emigration problem. The story of German colonization is short but instructive. The Germans had none of the experience which Britain had bought so dearly; their methods were closely akin to those of the old Spanish system, which regarded colonies as estates to be worked for the benefit of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the mother-country. The history of the African colonies was one of punitive expeditions. But so long as Germany was content to plant her colonies in unclaimed lands she could not seriously disturb the peace of the world. When William II came to the throne he threw Bismarck's caution to the winds. Impatient of all advice, he dismissed his adviser (1890). "Only one is master within the Empire and I will tolerate no other." As a shrewd Frenchman remarked, "The Kaiser always wants your friendship against someone else."

The development of the German navy was a sort of barometer which indicated the increasing pressure of the atmosphere. In 1898 the building of a large fleet was seriously contemplated, and two years later plans matured. "I shall not rest until I have brought my fleet to the same standard as my army," declared the Kaiser. In the German armies, unquestionably supreme in Europe, there had been an ever-increasing "peace" establishment. Germany was the best judge of her defensive needs. The existence of two long lines of land frontier were ample justification. Then, having put her hand to the plough, she found it impossible to turn back.

Since the defeat of 1870-1871, French policy had been devoted to recuperation at home with colonial development abroad. So far from wishing to provoke a quarrel with Germany, France studied to avoid having one thrust upon her. But her conspicuous success as a colonizing Power counted to her for unrighteousness. The acquisition of Tunis (1882) led directly to the Triple Alliance of Germany, Austria and Italy.

We have seen how the colonizing efforts of Germany had achieved little or no success. But comparative failure overseas does not apply to German colonizing within Europe. From the days of the Teutonic Knights of the thirteenth century to the Prussian "peaceful penetration" of Turkey early in the twentieth, events proved that the Germans possessed a natural driving force which impelled them to overflow their borders and bestow the blessings of "a superior civilization" upon other lands.

As a race they are extremely industrious, and they have produced rulers and generals who have been endowed with vast ambitions and great strength of character. After the day of Bismarck there arose a powerful party with a very different programme. The Pan-German League was founded in 1886 by Dr. Karl Peters. It came to be all-embracing in its ambitions, for it included not only the acquisition of a navy, and overseas colonies as markets and havens for the German emigrant, but also a scheme for colonizing the whole of Central Europe. Even this was not the end of the colossal Pan-German schemes. The Turks were a played-out people but still possessed vast resources in Asia Minor and Mesopotamia. So began the plan for a Berlin-Baghdad railway. In the scheme Great Britain saw the ever-increasing menace of Germany to her power in Egypt and the East.

This was the scale upon which the Pan-Germanists were prepared to work. "The wave beat knocks powerfully at our gates and calls us . . . to pursue world-policy." So spake William II in 1900. Doubtless he saw in the fulfilment of some or all of the Pan-German schemes the consummation of his restless personal ambition. The age of Imperialism was the opening chord of the twentieth century and the prelude to the greatest catastrophe the world had ever known.

Notwithstanding the historic rivalries of France and England, which had led to so many wars, it was clear that prudence now dictated that they should make common cause against the new Germany. Largely through the tactful offices of King Edward VII, the *Entente Cordiale* was concluded, shortly after expanded into the *Triple Entente* by the adhesion of Russia.

The Occupation of Egypt.—There was an obvious relation between the British Empire and the political condition of Egypt—up to 1922 a British Protectorate. Egypt, in a broad sense, was the strategic flank of India, and to hold India securely Britain had to be sure of her communications through the Mediterranean, the Suez Canal and the Red Sea. The completion of the Suez Canal in 1869 forced Egypt into the forefront of Britain's imperial vision. But ever since the decline of Turkey created an Eastern Question, an Egyptian Question has existed for her.

It was Napoleon who saw clearly that the path to Indian conquest lay through Egypt. Writing of Alexandria, he says, "The city ought to be the capital of the world; it is situated between Asia and Africa and connects Europe with the Indies." In the confusion which followed the withdrawal of the French in 1799, Mohammed Ali, an Albanian adventurer, achieved such power that the Sultan thought well to name him Pasha. In forty years he did more for Egypt than had been accomplished by Turkey in three centuries.

Ismail, his grandson, who succeeded in 1863, brought ruin on his country and was directly responsible for the British occupation. In thirteen years he had incurred a debt of over £91,000,000 and had nothing to show for it except the Suez Canal and the title of Khedive—bought at a high price from the Sultan. Even the canal brought no direct benefit, for in 1875 Disraeli bought his shares for £4,000,000. The country went

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

bankrupt, and to satisfy bona-fide creditors an international commission was formed—the Caisse de la Dette—the business of which was to receive a portion of the yearly revenue and pay off the interest due.

In 1879 Ismail was deposed and Great Britain and France undertook a Dual Control, Britain's representative being Major Baring (afterwards Lord Cromer). It seemed that a period of peace, retrenchment and reform might redeem the country from chronic bankruptcy. This was not to be. In 1881 native officers, led by Arabi Pasha and fearing reductions in the army and increased foreign control, raised the cry of "Egypt for the Egyptians." On the refusal of France to take further action, it was left to the British forces to restore order. At Tel-el-Kebir (1882) Arabi's forces were scattered to the winds of the desert, and the British Army of Occupation became the real master of Egypt. Lord Cromer and his subordinates meanwhile were busily employed on the work of reconstruction. To have raised Egypt out of all her misery, and to have created a modern, prosperous and peaceful state in the short space of twenty years, is one of the most remarkable achievements in modern history.

The Scramble for Africa.—We turn from Egypt to other parts of Africa. During the first half of the nineteenth century the interior of Africa was almost entirely unknown, but in the third quarter of the century the expeditions of explorers, more especially of Livingstone and Stanley, aroused European interest. Then, in 1884, began what is known as "the scramble for Africa." The European Powers, eager for new outlets, began a general scramble for new territories and "spheres of influence." The result was that France obtained in North-West Africa an enormous empire stretching from Algiers to the Congo River. Germany secured not far short of a million square miles on the east and west coasts, and Italy had possessions bordering on the Red Sea or adjacent to it. King Leopold of Belgium had already formed the Congo Free State in 1880, and Portugal had extended her ancient possessions on either coast.

Great Britain was not far behind the other competitors. She already possessed Cape Colony, Natal, Sierra Leone and the Gold Coast. To these she now added Bechuanaland and Rhodesia. On the west coast a British Company developed Nigeria, while the East Africa Company was developing the territories of British East Africa and Uganda. Naturally the scramble led to considerable diplomatic complications, but on the whole it was a form of colonization by peaceful means and "pegging out claims," rather than penetration at the point of the sword.

Peace Ideals and "Real Politics."—The years from 1878 to 1912 were marked by no great European war. Never since the days of the Roman Empire had there been so long a period of peace. But it was an armed peace, and there was no genuine feeling of security. The Triple Entente and the Triple Alliance began a competition in armaments, and there ensued a naval race in which strength was measured by the number and size of great battleships. Attempts were made from time to time to obtain agreement about the limitation of armaments, but never with much success. In 1899 the Tsar issued the rescript which led to the first conference at The Hague. In 1907 the Second Hague Conference amended and enlarged the "Laws and Customs of War."

The age of Imperialism saw in war a wholesome medicine for nations. Against the ideal of international peace there arose an "armed doctrine" which we may call "real politics." The Hague Conferences recognized with Mazzini a higher necessity than success at any price, namely, that nations are citizens of humanity.

It was, however, recognized as being far more important to prevent wars from breaking out at all than to limit the sufferings which inevitably follow warfare. Since 1899 a Permanent Court of Arbitration has been in existence, and several notable causes of dispute have been settled by it. Many international treaties now contain clauses whereby the signatories agree to submit to arbitration any differences which might arise between them. From this it was a relatively short step to the Permanent Court of International Justice set up after the First World War, applying general principles of international law to the cases before it.

LXVI

SPAIN AND THE SMALLER STATES

In the history and the condition of those smaller states which have played a less important part in international affairs is found the same striving for national existence and the same impulse towards democratic government that was, throughout the nineteenth century, manifesting itself all over Europe.

Spain.—By 1815 there was little left to Spain of her past glories. During the eighteenth century she had sunk to the position of a poor dependant of France, and as such had suffered grievous losses in her colonies, which fell an easy prey to the sea power of Great Britain.

Upon Spain, as upon other parts of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Europe, the French Revolutionary and Napoleonic era left a deep impression. The Peninsular War (1808-14) proved that in spite of the selfish and incapable policy of their rulers the proud spirit of the Spanish people was yet far from extinct. This spirit of a people in arms, first shown in Spain, encouraged the national resistance in Germany and elsewhere which Napoleon was powerless to overcome. The bracing effect of this war of liberation was seen in another direction. In 1812 a Spanish Constitution was proclaimed, abolishing the absolute power of the king. This constitution was not workable in practice, but it pointed the way for future reformers and showed that despots in Spain, as elsewhere, must not expect for long to exercise their power unchallenged.

In 1814, when Ferdinand VII was restored to the throne, he determined to make short work of the reforming party. So oppressive was his rule that a general rising took place six years later. When called upon to serve abroad against the rebellious colonies the troops revolted and the king found himself powerless. Backed by the principles of the Holy Alliance and French bayonets, France stepped in and reimposed her tyrannous yoke. The French intervention was keenly resented by Britain, which was determined that Spain should not be assisted to regain her lost colonies in America. Her attitude was clearly shown by Canning's declaration, "I called the New World into existence to redress the balance of the Old." The enunciation of the Monroe Doctrine (1823) showed that the United States would brook no interference with the newly won liberty of the late Spanish colonies.

The revolt of his American colonies was the most important event of Ferdinand's discreditable reign. Spain had held sway over Mexico and the greater part of South America. But the good government and welfare of her colonies did not interest her. All native interests were sacrificed to those of Spain. It was the old colonial system at its worst. The War of Independence in North America had increased the spirit of unrest; as early as 1785 Spanish Americans had discussed with Washington the means of attaining liberty for South America, and in the first thirty years of the nineteenth century that liberty was gained.

The example was set by Mexico, where a federal republic was established in 1824. In Central America the provinces declared for republican institutions. In South America the hero of the movement was Bolivar, a Venezuelan Creole. By his personal efforts five South American republics were established, and he richly deserved the title of Liberator. He aimed at a federation of united states, but jealousies, the mixed nature of the population and vast distances between the separate republics have prevented the attainment of his ideal.

For Spain the loss of her colonial empire proved a blessing, since it concentrated the attention of her people on the neglected resources of their own country. But the last years of the nineteenth century and the first three decades of the twentieth have been a period of unrest in army, commercial and democratic circles. The abdication of King Alfonso XIII and the establishment of a republic in 1931 did little to settle the internal strife of the country. The excesses of the Communist-dominated government led to a revolt under General Francisco Franco, and a civil war which lasted until 1939, when Franco and the Nationalists secured power.

Denmark.—At the end of the Napoleonic Wars Denmark was almost ruined. She was condemned to pay heavily for her adherence to the French. The Continental System, whereby Napoleon sought to defeat Britain by rigorous exclusion of her goods from European markets, had killed Denmark's trade. In 1815 the Congress of Vienna deprived her of Norway.

Despite these heavy handicaps the little kingdom recovered rapidly. Up to 1848 most of the governing power remained in the king's hands, but in the following year a more liberal constitution was granted.

After 1864, when war with Prussia deprived her of North Schleswig, there was a wonderful development. In agriculture, stock-farming and manufactures the country prospered exceedingly. That Denmark should have made such progress after suffering the losses which the war entailed is one of the marvels of history. The nation set itself with energy to rebuild its prosperity on the basis of co-operative farming and food-marketing. The idea sprang from the Folk High Schools in which young Danish men and women were educated for the tasks of the new life.

Switzerland.—Switzerland assumed her present form at the Congress of Vienna. Her neutrality and independence of all foreign influences were formally acknowledged and guaranteed by the Great Powers. Since Napoleon no external invader has ventured to violate Swiss independence, and the main interest of Swiss history has lain in constitutional development. She has afforded the world a model of Federal Government which, if minute in scale, has proved eminently workable.

The languages which are habitually spoken in this very small country present much variety. The main interest of Switzerland to the historian is the successful fusion of three races to form a genuinely

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LXVII

THE NEAR EAST

GEOGRAPHY and providence have endowed the Englishman with a double portion of exclusiveness, and it is hard for him to grasp Balkan problems. He is the owner of a "detached" house; he is not overlooked. This was not so with the Balkan States; they were not even semi-detached, and the party walls were very thin. There were six different races in the peninsula, embracing three different creeds. They lived too close together to appreciate one another properly. In fact, they constituted a mutual-hate society which destroyed all hopes of making common cause with each other against the Turk.

The struggle for independence in Serbia began in 1804, when disorder within and Russian pressure without compelled the Turk to loosen his hold. When, in 1827, the Greeks threw off the yoke of Turkish oppression, the national spirit in the Balkans began to grow very quickly, and by the Peace of Adrianople two years later Serbia won a measure of self-government. In Bulgaria, closer to the centre of Turkish rule, the first stirring of the national spirit was not witnessed until 1870, when a Church, independent of the Greek Patriarchate, was readily recognized by the Sultan. Turkey, the sick man of Europe, was a decadent nation, and not in a condition to avoid making concessions. Unhappily this brought the renewal of dissensions, and Greek was now pitted against Bulgar. It was precisely the atmosphere which for centuries had favoured the persistence of Turkish despotism.

The Danubian principalities of Moldavia and Wallachia lay clear of the Turkish advance. Gradually, however, they fell under her pernicious control until, in the early nineteenth century, Russia began to interest herself in the provinces and disputed control over them with Turkey. In 1859 the two states were united, and in 1878 complete independence was secured. Three years later the principality became the kingdom of Rumania.

The independent spirit of the Balkan nations had not died with the Turkish conquest; it had been ruthlessly held under. By the opening of the nineteenth century the Turkish Empire seemed doomed to dissolution and the peoples of the peninsula began their struggle for independence. That the Empire survived so long is due partly to her strange vitality but in the main to the conflicting ambitions of the great European Powers. The spoil was so valuable that they could never agree to a peaceful division. Great Britain and France, mutually jealous, were mortally afraid of Russia, so that Turkey became in turn the protégé of France, Great Britain and Germany, and out of this position she sucked no small advantage. It enabled her with impunity to defy the dictates of God and man in the treatment of her subject peoples.

Up to 1878 Turkey was bolstered up in her wars with Russia. In the Crimean War Great Britain and France definitely allied themselves with her in order to prevent Russia from hastening the death of the "sick man." But the Treaty of Paris (1856), admirable "on paper," proved, in effect, utterly futile. It depended for its success upon the ability of the Turks honestly to carry out their promised reforms in the treatment of their Christian subjects. Between 1856 and 1878 events in the Balkans led directly to a repetition of the pre-Crimean situation. The Bulgarian atrocities of 1876 startled Great Britain and the Western Powers and gave Russia an opportunity to take the field as the champion of the Pan-Slav movement. Left to herself, Russia would have cut the Ottoman Empire in pieces by the creation of a "Big Bulgaria" at the Peace of San Stefano, but the Powers intervened, and the Congress of Berlin (1878) met to readjust the map of Eastern Europe.

In so far as it set out to prevent Russia from dismembering Turkey it was a success. In so far as it established small states—Serbia, Montenegro, Bulgaria and Rumania—in real or virtual independence, it deserved credit. In so far as it aimed at a peaceful settlement of the Eastern Question, it was a conspicuous failure. Austria-Hungary had now a definite stake in Balkan concerns by the control of Bosnia-Herzegovina. For her the decline of Slavonic Russian influence marked the entry of the Teutonic Powers with an aggressive forward policy which threatened to absorb the smaller Balkan States. While the Austrians occupied Bosnia there could be no union between the South Slavonic States—the ideal longed for by the Serbian nationalists. Bosnia-Herzegovina was an eastern Alsace Lorraine.

A critical year in Balkan history during the twentieth century was 1908. While the economic war was raging between Serbia and Austria the latter power annexed Bosnia and Herzegovina, an action which caused a European crisis and spelt national death to Serbia. From that moment it became quite clear to every Southern Slav that war could not long be delayed. In the same year the "Young Turkish" revolution deposed the Sultan but showed to the onlookers that power had merely been transferred to an unscrupulous clique supported by the army. Taking advantage of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

revolution, Bulgaria proclaimed its complete independence.

In 1911 Italy, growing uneasy for her position in the Mediterranean, declared war on Turkey, gaining Tripoli and the Dodecanese Islands by the Peace of Ouchy. Serbia, Greece and Bulgaria took advantage of the situation in 1912, and Turkey lost much European territory. One year later the second Balkan War saw the defeat of Bulgaria by Serbia, with Greek, Rumanian and Turkish assistance. The quarrel was occasioned by the Serbian desire for an outlet to the sea which had been thwarted by the creation of Albania. The Treaty of Bucharest (1913) proved merely a triumph for Austrian diplomacy. It did little else than "paper over the cracks."

Behind the unsettled Balkan questions there loomed still vaster issues—the future of the South Slavs in the Dual Monarchy, the peaceful penetration of the Near and Middle East by Germany, the Teuton fear of Russia, and, over all, the heavy burden of armaments.

LXVIII

THE FIRST WORLD WAR

Prelude.—The situation in Europe from 1911 onwards was such that diplomatists and statesmen could scent war in the air. In that year had occurred the Agadir crisis when Germany, by sending a gunboat to the Moroccan harbour, alarmed France and Britain, who drew closer together. It was felt that any precipitate act from any quarter might bring on a catastrophe, as a loud noise has been known to launch an avalanche.

That Austria did not intend to keep the peace was soon suspected. But for two facts the attack on Serbia might have come in 1913. Italy was unwilling to join in a war of aggression, and the preparations of Germany were incomplete. The new Army Bill of the spring of that year provided for a great increase in numbers and equipment. The work of deepening the Kiel Canal was not finished. The year 1914 was to see the German Army and Navy in a much stronger position. Russian finances, it was thought, could not long support the strain of a great war. In France attention was riveted to scandalous party strife. The army was large, but its equipment untried. The Act ordaining three years' service provided for future but not for present security.

British intervention in a great European war was not expected; in any case, Britain appeared to be sufficiently absorbed in her own problems. Civil war seemed imminent in Ireland. There was a strong belief on the Continent that her empire was a danger rather than a support. Moslem risings in India and Egypt, rebellion in South Africa, defensive weakness in Australasia and Canada would quickly prove that the British Colossus had feet of clay. Britain's great naval strength was not disputed, but its power to deflect the rapid sweep of German arms in Europe was not so evident. British intervention in land operations was expected to be negligible. If Germany must have war, conditions could never again be so favourable to her.

Behind all this was the growing conviction of the German military aristocracy that the health and wealth of the nation could be preserved and promoted only by war. The diplomatic intercourse of the last days of July proved the true intention of Germany beyond all doubt. She refused every suggestion that might lead to peace. Her lot was cast for war.

The Outbreak.—On June 28, 1914, the brutal murder of the Archduke Franz Ferdinand, heir to the Dual Monarchy, and his consort by two Serbs at Serajevo was made the occasion of the outbreak of a war which, as we have seen, seemed bound to occur in the near future. All Europe sympathized with the aged Emperor upon whose dynasty one more tragic blow had fallen. But for three weeks Austria withheld her hand and made no sign. Then, on July 23, she presented an ultimatum to Serbia. The reply of the latter was respectful and submissive, but the Austrians were dissatisfied and on the twenty-eighth declared war.

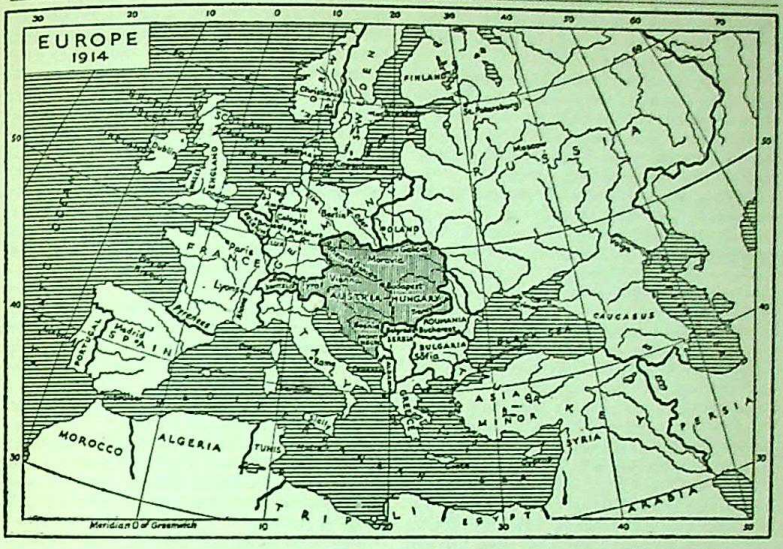
Russia mobilized on the Austrian frontier, and appealed for help to France and Great Britain, and the French replied that they would stand by her to the last. The British declared that they felt they ought not to go to war over a Serbian question. On August 1 Germany declared war on Russia. Next day she demanded that Belgium should open her frontiers, and declared war on France. The violation of Belgian neutrality ensured the entry of Britain, who declared war on Germany on August 4.

The First World War.—The final, irrevocable step had been taken, and for four years the world was plunged into the most desperate struggle then known to history. Sweeping over the plains of Belgium and France, the Germans reached the very gates of Paris. It was the heart and centre of their plan to carry everything before them at the very first and end the war on the western front in a few weeks. Then their whole attention could be turned to the East. But fate decreed otherwise, and the heroic resistance of the Allies turned the tide. Thereupon, for four years the combatants settled down to an unprecedented form of warfare—trench warfare.

For the present the war of movement in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



the west was over, and from the Channel coast down to the Swiss frontier the opposing forces faced each other across a narrow strip of "No Man's Land." Both sides were short of the specialized arms which this kind of warfare demanded, and the extension of the war to the Near East reduced the reserves of men and material so much that little strength remained for major offensive operations in France.

A desperate attempt to effect a breach in the enemy's Balkan front was launched in the Spring of 1915 at Gallipoli, in the Dardanelles, by the Anzacs (Australian and New Zealand Army Corps). But the Turkish defences held and the allied forces were eventually withdrawn and transferred to France. During May of that year Italy repudiated her alliance with Germany and Austria and entered the war on the allied side, having been promised considerable territorial gains for so doing. Reinforcements began to arrive in France from new armies raised in Britain and overseas. Recruitment was still on a voluntary basis; conscription was not introduced until 1916.

General dissatisfaction with the conduct of the war on the British side led to the replacement of the Asquith Coalition Government by an administration led by Lloyd George, who had been Minister of Munitions. The mounting supply of material was now making possible an attempt to soften the enemy's front by intensive bombardment. But again at the Somme, as earlier at Ypres and elsewhere, exhaustion quickly set in. After relatively slight adjustments of the line there followed a standstill in the mud of the trenches. Meanwhile, German and Austrian diplomacy had been active in the Balkans and Bulgaria was won over. Rumania joined the Allies, but was rapidly overrun by the enemy.

The year 1917 opened critically for the Allies. Losses of ships from unrestricted submarine attack threatened Great Britain with starvation, and compelled the Government to introduce limited food rationing. When these attacks began to affect American ships, there followed a rapid change of attitude across the Atlantic.

The entry of the United States into the conflict was a triumph of diplomacy. Relations were subject to the same general conditions as in Napoleon's time but, owing to wiser management and a better spirit, took an opposite turn. On both occasions the interests of Britain as the great blockading Power necessarily clashed with those of the neutral merchant Power desirous of sending her goods as usual to the European market. Sir Edward Grey, the British Foreign Secretary, sacrificed points of real military value in permitting the passage of cotton and other articles to the enemy in order to prevent an early explosion of American opinion against the Allies. Owing to the careful methods of the British blockade-diplomacy, the pro-Ally feeling in the States and the German submarine attack on American persons and shipping were given time to operate and draw the great neutral into the contest on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the side of the Allies. The entry of the United States into the war in April, 1917, was a large deciding factor.

It took time to train and equip the American armies, and it was not until the early months of 1918 that the full effects were felt in the front line. The aid of the American navy was more quickly brought to bear on the situation. It enabled a system of naval convoys to be organized, and immediately the rate of sinkage of merchant ships began to fall. Meanwhile, the American shipyards were turning out new ships at an astounding rate, and the spectre of famine in Great Britain passed.

On the Eastern Front, the war dragged on with little prospect of a quick decision, though the strain was telling heavily on the Russians. Their armies were poorly equipped and not always well led, while a mutinous spirit was being fostered. In March, 1917, riots broke out in Petrograd. A revolutionary junta seized power and the Czar, Nicholas II, abdicated. A hasty peace was concluded with Germany by the Treaty of Brest-Litovsk (March, 1918). Four months later, the Czar and all his family were murdered by the revolutionaries.

Russia being now out of the war, the Germans were able to concentrate on the West, and preparations were made for their supreme effort. The attempt, known as the Second Battle of the Somme, came near to complete success. A break-through was achieved, and the war again became one of movement. Paris was once more threatened. The crisis brought about a unification of the supreme command under Marshal Foch. In July a counter-stroke was started. Blow after blow gave the enemy no respite, and the pressure was maintained until the Allies broke through the Hindenburg Line into the open country beyond. At the same time success came on other fronts. The Turkish armies gave way in Mesopotamia; Allenby entered Palestine and captured Jerusalem. In the Balkans the Allies broke through the Bulgarian defences. In Italy the line of the Piave River was forced, and the Austrians were signally defeated at Vittorio Veneto. The Central-European bastion was collapsing. The end was near when, in October, first the Turkish, and then the Austro-Hungarian, commanders capitulated. The German surrender followed; at 11 a.m. on November 11 an armistice was sought and granted.

In the naval war, only one engagement was fought involving the great fleets, the Battle of Jutland (1916). Both sides claimed victory. The British losses were the greater, but the far smaller German fleet retreated to its base, leaving the British, as before, to control the North Sea. This was the last time that the German fleet risked battle. It became for the enemy a war of attrition; for the Allies it was a war of blockade. In the spring of 1918 the effects of the blockade on the civilian populations of Central Europe were becoming serious and there was partial famine. The morale of the German sailors declined; it was the mutinous spirit in the fleet which brought the revolutionary movement to a head and forced the final surrender.

The war was over. The Germans, Britain's chief opponents, had fought throughout with extraordinary skill and tenacity and they had at times been near decisive success. The war which had involved most of Europe cost the European nations thousands of millions of pounds, and it left a long ribbon of completely devastated country from Verdun to the sea. But the most tragic features of the war were the loss to Europe of the best of her manhood, and the misery and unhappiness that the loss brought to millions of homes.

The casualties of the British Empire totalled over a million killed and 400,000 wounded; of Allied and associated countries, nearly two and a half million in dead; and of enemy countries, 3,000,000. Germany alone lost over two million men of her armed forces.

LXIX

THE REMODELLING OF EUROPE

The Treaty of Versailles, 1919.—In 1919 the victorious Allies met in conference at Versailles to reconstruct the map of Europe, and to exact what was possible by way of reparation for the ruin brought about by the Germanic Powers. Unlike the Vienna Conference of 1815 the vast assembly at Versailles was representative not merely of European Powers and interests, but of all the twenty-seven states which had declared war on Germany. It was a World Conference, although the ultimate decision of all important business lay in the hands of five Powers—Great Britain, France, the United States, Italy and Japan. The enemy states were not represented. Broadly speaking, the treaty with Germany, as drafted at the Conference, agreed in principle with the Fourteen Points enunciated by President Wilson in January, 1918.

In his speech President Wilson had outlined what he declared to be "a programme of the world's peace." Perhaps the most important of his Fourteen Points were:

(I) Open covenants of peace openly arrived at after which there should be no

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

private international understandings of any kind, but diplomacy should proceed always frankly and in the public view.

(IV) Adequate guarantees given and taken that national armaments would be reduced to the lowest point compatible with domestic safety.

(VIII) All French territory should be freed, and the invaded portions restored, and all the wrong done to France by Prussia in 1871 in the matter of Alsace-Lorraine, which had unsettled the peace of the world for nearly fifty years, should be righted in order that peace might once more be made secure in the interests of all.

(XI) Rumania, Serbia and Montenegro should be evacuated, occupied territories restored, Serbia accorded free and secure access to the sea, and the relations of the several Balkan states to one another be determined by friendly counsel along historically established lines of allegiance and nationality, and international guarantees of the political and economic independence and territorial integrity of the several Balkan states should be entered into.

(XIII) An independent Polish State should be created, which should include the territories inhabited by indisputably Polish populations, who should be assured a free access to the sea. . . .

(XIV) A general association of nations must be formed under specific covenants for the purpose of affording mutual guarantees of political independence and territorial integrity to great and small states alike.

What, then, was the general result of the treaty and its subsequent modifications? Territorially the treaties attempted, so far as was practicable and reasonable, to redivide Europe on the basis of self-determination, of allowing peoples with a distinct culture, language or historical tradition to compose independent states. In the south-east the territory of Turkey in Europe was reduced to Constantinople and a small strip of land outside it, whilst the League of Nations was given control of the Straits and the land on either side. On the other hand, the territory of Rumania was more than doubled and that of Greece greatly increased. The kingdom of Yugoslavia was created to include Serbia, Montenegro and the Slav provinces which belonged before the war to Austria-Hungary. Germany, besides giving up part of Poland which had been hers since the eighteenth century, gave up Alsace-Lorraine and the northern half of Schleswig, which she had taken from Denmark in 1864. She had to allow the Saar Valley coalfield area to be worked for the benefit of the French for fifteen years in reparation for damage in the French coal-mining area. Her colonies were divided among the Allies, while she had also to pay a huge indemnity, the left bank of the Rhine being put in Allied occupation by way of security. A study of an atlas will give a very good impression of the territorial alterations achieved by the post-war settlements.

To the twenty-seven states of which Europe had formerly consisted, six were added, namely Poland, Czechoslovakia, Finland, Lithuania, Latvia and Estonia. The link between Austria and Hungary was severed. Changes on this scale could not be made without profound disturbance to the balance of economic and political forces, and immediately new stresses and strains arose which were even more dangerous than those which the Treaty of Versailles was intended to remove.

The making of the new Poland was attended by one consequence of the greatest significance for the future of Europe and the world. To give Poland access to the sea, a corridor was cut through East Prussia, while the port of Danzig was put under international control exercised through the League of Nations. Thus East Prussia was separated from the rest of Germany. The existence of the Polish Corridor rankled in the German mind as a major injustice, and it was obvious that, sooner or later, the Germans would agitate for a revision of their new eastern frontier. The position gradually became all the more dangerous because, with the rise of nationalism and that of the Nazis, the Germanic peoples in the lost territories clamoured to be re-incorporated in the Reich.

Other danger spots existed in the states which had been created out of the remainder of the dual empire. By the Treaty of Trianon, the province of Transylvania had been transferred to Rumania, who had been promised this territory in 1916 as a reward for joining the Allies. But the transfer involved the separation of three million Magyars from their kinsmen in Hungary. The result was that a vigorous revisionist movement started.

The inclusion in Czechoslovakia of a considerable Teutonic minority, also numbering about three million people, boded no good for the new state. The region they occupied, known as the Sudetenland, contained the bulk of the great industries, but the Germans in this area suffered many disabilities at the hands of the Czechs, and came to look to Germany for redress.

The indemnity clauses of the Treaty were quickly found to be unrealistic, and those who had clamoured to make Germany pay to the last farthing found themselves impaled on the horns of a dilemma. Germany could pay only if she were permitted to manufacture and to export. But it was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thought that to allow this would be to risk the possibility of her growing so strong again that she might dream of a war of revenge. Moreover, in the "dumping" of German goods there appeared to be a threat to home industries. In the minds of the French, the first consideration was to keep Germany weak. The other point of view was that of President Wilson, who wanted a conciliatory peace as a fitting close to "a war that was to end wars."

Linked up, therefore, with the Peace Treaty was the Covenant of the League of Nations, an organization of international scope for settling disputes before they grew to dangerous proportions and, further, for bringing to bear pressure, economic or military, on states which failed to honour their pledges under the Covenant. The confident hopes which attended the making of the Covenant received a rude shock when the Americans refused to ratify it, fearing involvement in the quarrels of a war-infested continent. Isolationist feeling in the United States was strong enough to keep her out of the League.

The Germans, from the start, declared themselves unable to pay their terrific indemnity. On account of the enormous inflation, their currency, based on the mark, soon became virtually worthless. The French occupied the Ruhr, but after a new currency (under the Dawes Plan) had been issued the Ruhr was evacuated (1925). In the following year, Germany was admitted into the League, and so promising were the prospects of international amity at this time that the withdrawal of the occupying troops from the Rhineland took place in 1930, five years before the time stipulated in the Treaty.

The Rise of Fascism.—The troubles of Italy at the close of the First World War became greatly aggravated by the demand of the Socialists for the formation of a bolshevist state on the lines of Russia. To combat the menace, the Fascist movement was founded in 1919 by Benito Mussolini, afterwards "Il Duce," then merely the editor of the newspaper *Il Popolo d'Italia*, and himself an ex-Socialist.

Industrial troubles vexed the country, and there were frequent disturbances between the "Red" Communists and the black-shirted ever-growing Fascist Party. Gradually the riots of the discontented masses, and the shadow of national bankruptcy, together with the extraordinary devotion to the national cause shown by its members, directed the sympathy of public opinion towards the Fascist Party. In 1922 matters came to a head. The Fascists marched on Rome and took possession of the city. This *coup d'état* was accomplished with the greatest ease. The King sent for Mussolini, their avowed leader, and he arrived bearing a list of his chosen Cabinet, which was at once accepted. The "implicit Republican tendency" was shed by Mussolini's expression of his adherence to the monarchy.

For more than twenty years Mussolini directed the government of the country. He instituted reforms of many descriptions, but he also became a thorough-paced dictator. One major object of his policy was centred on making the Mediterranean an Italian lake. This would enable him to add to the power and possessions of his country.

An important rapprochement took place in February, 1929, between the Pope and the Fascist State. A political treaty was signed, by which Italy recognized the Papal sovereignty. The Vatican now forms a tiny state, negligible territorially, but with its own wireless station, postal arrangements and railway station. His Holiness accepted the gift of a special Papal train. This treaty marked the end of an unsatisfactory phase which had lasted since the "Risorgimento,"* when Pius IX (1846-1878) had lost touch with the Italian nation, and the young nation had thrust him into a position detrimental alike to his dignity and his authority.

Italy was raised to the position of a first-class power. Then Mussolini's overweening ambition showed itself. The Italo-Abyssinian Treaty of Friendship and Arbitration, signed in 1928, was broken by the dispatch of a large and well-equipped army to North-East Africa. The Abyssinians fought stubbornly. "Move forward at all costs; conquer at whatever price," was Mussolini's order to de Bono, the commander-in-chief. In May, 1936, King Victor Emmanuel III was proclaimed Emperor of Ethiopia, and 350,000 square miles were added to Italian territory. Economic sanctions against Italy, agreed upon by some fifty countries, were applied half-heartedly and made Mussolini all the more determined.

Turkey.—The Turks, incensed by the terms of the Treaty of Sèvres, which transferred ownership of Eastern Thrace and Smyrna to Greece, set up a Nationalist government in Ankara with Mustapha Kemal (Ataturk) as President, and declared war on Greece. The League of Nations, feeling that it had no moral authority to intervene, accepted the situation and negotiated the new Treaty of Lausanne which followed the Turkish victories. The revised Treaty gave Constantinople to Turkey, but put Syria, Palestine and Mesopotamia under mandates. To minimize the risk of political disturbance arising from the presence of discontented minorities, a compulsory exchange of populations was carried out. The Caliphate was abolished.

*See Chapter LXIII.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and an era of reform began which in scarcely more than a decade transformed the life of Turkey, breaking down the ancient traditions which had endured for so many centuries. In particular, the women of Turkey were emancipated, western modes of dress were introduced, the Christian Calendar and the western alphabet were adopted. High importance was attached to education.

The Coming of Hitler.—In March, 1918, Anton Drexler, a Munich artisan, founded what he called the Committee of Independent Workmen, a name afterwards changed to the National Socialists Workers' Party, or Nazis. Adolf Hitler, an Austrian house decorator, who had risen to the rank of lance-corporal during the First World War, joined the organization, and by his fervid oratory attracted considerable attention to it and himself.

A financial crisis aided and abetted the growth of the movement. By May, 1923, its enrolled members totalled over 200,000, with an army of Brownshirts obviously based on Mussolini's Blackshirts. A *putsch*, or rising, took place in the following November but proved abortive, Hitler being arrested. Sentenced to five years' imprisonment, he employed the six months that he was called upon to serve by writing *Mein Kampf* (My Struggle), a crude and jangled philosophy which became the Bible of the Nazis.

In it he prophesied that the world would one day be the scene of dreadful struggles for existence. "Man," he avowed, "has become great in perpetual struggles." This was no more than a paraphrase of the teaching of General F. von Bernhardi (*d.* 1930); but it served its purpose. The national spirit of the German people was inflamed. Some 2,000,000 of them voted for Nazi candidates in the parliamentary election of 1924; thirty-two were successful. Six years later 107 Nazi deputies took their seats in the Reichstag, and in January, 1933, President Hindenburg, much against his will, was compelled to ask Hitler to become Chancellor of Germany. The sequel to this is told in Chapter LXXII.

The League of Nations.—Reference has been made to the League of Nations, which was briefly outlined in the last of President Wilson's Points. There is nothing new in the idea of a league to preserve peace. Such a league was the Holy Alliance (1814), that "loud sounding nothing" that expressed the will of the princes but not the will of the people.

The League of Nations, notwithstanding early setbacks, carried on its work of international organization and conciliation from the headquarters which it established in Geneva. The International Labour Organization collected information concerning labour conditions, and did much to bring it about that the standards of the best might become the standards of all. Another important contribution was to regulate the traffic in drugs and to promote welfare of women and children. The League intervened with success in a number of minor disputes and helped in stabilizing the currencies of the defeated states.

On the political side there were weaknesses which gradually became obvious. We have seen that the United States stayed outside. Soviet Russia joined only in 1934, a year after Germany and Japan had withdrawn. Thus the League never commanded anything like universal support. The member states often neglected to pay their dues, and to ratify decisions agreed to by their representatives. No nation was prepared to surrender a portion of its sovereignty, a *sine qua non* if collective action was to be taken. Further, the League, having no authority to insist on the revision of treaties, came to be regarded as merely the custodian of the original peace treaties. States which felt themselves strong enough either defied the League or walked out.

In 1931 a test case arose. Japanese forces invaded Manchuria, then a part of the Chinese Republic, and set up the puppet government of Manchuria. China appealed to the League for help against the aggressors. The League sent out a commission of inquiry, but rather than submit to its decision Japan cancelled her membership. The decision eventually reached was that Japan was not an aggressor in the sense of the Covenant, and China was left to fight alone.

Four years later the League was faced with a situation which was a still severer test. Mussolini, fired with imperial ambitions, decided on the conquest of Abyssinia. This time the nations were invited to apply economic sanctions to Italy. A number did so, but so wide were the loopholes and so half-hearted the response, that Italy was hardly more than inconvenienced, and the conquest proceeded according to plan. Sanctions were eventually abandoned and it was not long before most of the states of the world accepted the fact of Italian sovereignty in Abyssinia.

These two examples of the failure of the League to impose her authority were followed by the spectacle of its impotence in the matter of the civil war in Spain. In 1931 the monarchy was abolished and a republic established. The radical tendencies of the government in 1936 led to a military revolt led by General Franco. Starting in Morocco, it quickly spread to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Spain, and a bitter strife marked by the cruellest brutalities ensued.

The three great dictatorships, Germany, Italy and Soviet Russia, could not forbear to fish in such troubled waters, the first two on the side of the Nationalists and Russia on the side of the Leftist government. The policy of the League was non-intervention, but there was no effective way of enforcing the policy. The civil war in Spain had the aspect of an initial trial of strength between the Fascist and the Communist powers, a prelude to the war in Eastern Europe which was soon to be fought.

Apart from the substitution of right-wing for left-wing government in Spain, the principal outcome of the civil war was to emphasize the deep cleavage which was dividing the world. The "Axis," or bond of union between Germany, Austria and Italy, was lengthened by its extension to Japan, the latest adherent to the Anti-Comintern pact, designed to combat the growing Communist threat. The western democracies, though recognizing the danger to international peace, were hesitant to act for a number of reasons. Britain, relying on collective security, had allowed her armed forces to fall below a standard of safety, and pacifist opinion was strong. It was difficult for the states governed on constitutional principles to make common cause with Russia. The countries of north-east Europe, Belgium, Holland, Denmark, Finland, Norway and Sweden, clung to neutrality as a sheet-anchor. Only the dictatorships, it seemed, had the will to act, and the drift towards war was unmistakable.

LXX

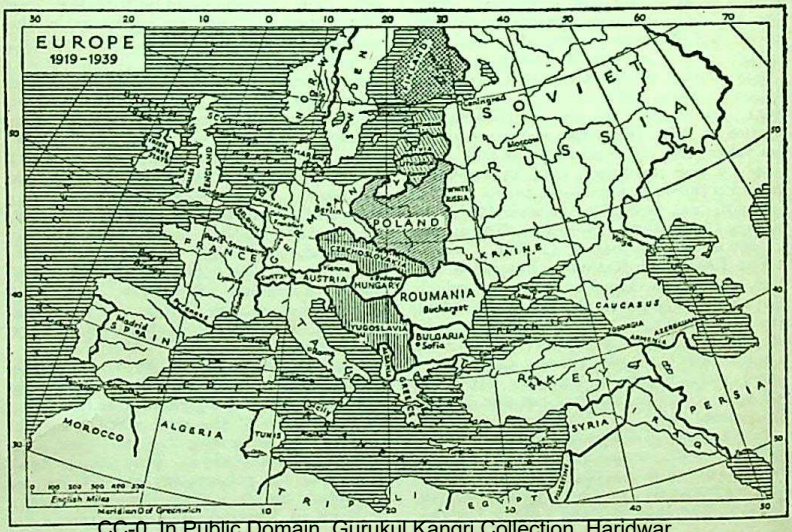
RUSSIA FROM CATHERINE THE GREAT TO BOLSHEVISM

Catherine the Great (1762-1796).—After the death of Peter the Great, Russia gradually became Teutonized. Instead of Muscovite nobles, German courtiers now had the ear of the throne, and the influence of Frederick the Great dominated Russian politics until the accession of Catherine II (1762-1796). With Catherine the Great, Russia started her cultural and intellectual history. The French encyclopædists were studied and Diderot personally patronized by the Empress. Ideas on the emancipation of the serf, on democracy and on education were in the air. Catherine's reign saw the first genuinely popular rising, under the Cossack Pugachev (1773), which Trotsky considered to be the first protest in the modern manner against the tyranny of Russian autocracy.

Plans for the partition of Turkey were conceived, and if Catherine failed to achieve this completely, she gained what Peter the Great could not, a firm hold on the Black Sea and Lower Danube (1774).

Reaction and Reform.—The French Revolution and the Napoleonic Wars altered the perspective of Russia, as of all Europe.

The complete failure of Napoleon's march



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on Moscow in 1812 and the Battle of Waterloo (1815) left Alexander I (1801-1825) in a position of dominating influence over European affairs. He became the advocate of the most uncompromising reaction. The Leftist movement in Russia was thus violently arrested, and the new ideas were left to fester in secret societies, organizations like the Decembrists (1825), amongst soldiers, journalists and a new class in Russia—the intelligentsia.

While Alexander I and his successor, Nicholas I (1825-1855), pursued a policy of the Strong Arm, outcome of a very natural fear of the repetition of the French wars, the Socialist movement was beginning to raise its head. Students were learning dialectic and political philosophy at the newly reformed universities of Moscow and elsewhere. Literature and ideas were beginning to develop rapidly under the influence of a number of brilliant writers; on the one side, representatives of Western culture and civilization; on the other, slavophils, dreamers who felt that Russia had something very vital, Messianic, to contribute to the world, and who rigidly shunned contact with other cultures from fear of corruption. This over-absorption in the imagination at the expense of action accounts for much that is difficult and baffling in Russian history. The Russian revolution was, amongst other things, a determined and conscious attempt to throw off this Slavonic Hamlet complex, which half strangled the leading thinkers of the nineteenth century.

Nicholas I, no Hamlet but a dictator, constructed railways, improved the army and the fleet, encouraged manufactures and commerce, codified laws and improved the administration with the sure touch of a martinet. Abroad he made Russia for many years supreme at Constantinople. In this he was opposed by England and France; and attempts to secure the rights of the Orthodox Christians in Turkey led to the Crimean War, ended by the taking of Sebastopol (1855) and the Treaty of Paris (1856). This proved an effective check on Russian aggression in Asia Minor.

Alexander II (1855-1881) earned for his reign the title of "the epoch of the great reforms." By contrast with Nicholas, he was a man of idealistic views and had strong popular sympathies. The result was the emancipation of the serfs (1861), who now became the proprietors of communal lands; the old tribunals were abolished, and criminal and civil law-courts of the French type established; local councils elected by the populace were set up, and education, that watchword of the nineteenth century, strongly encouraged.

Reaction and Oppression.—The reforms proved less popular than prophets imagined. Liberalism was threatened by Nihilism and extreme revolutionary propaganda. The people began to believe that the obstacle to universal happiness lay with the Government officials. Many were assassinated, and finally the Emperor himself was murdered by Nihilists in 1881—a bitter commentary upon the fate which besets the path of the pioneer reformer.

Alexander III (1881-1894) identified himself once more with the old party of reaction. The policy of the Emperor was that of the Slavophil badge; Nationality, Orthodoxy and Autocracy. Systematically he carried this out, and some, notably the Jews, suffered severe religious and racial persecution. In Asia the Russian expansion threatened the interests of British India, and during the eighties and nineties England was more than once on the verge of war with Russia. During his reign the Trans-Siberian Railway was built.

Nicholas II (1894-1917), who succeeded, continued much the same course, though he caused the more vigorous anti-Semitic and religious measures to drop. The policy of Russification in Finland and other dependencies was maintained. The principle of variety in unity was not recognized by the Russian Czar; nor, it is interesting to note, was it encouraged by the U.S.S.R., at least in the earlier phases. To a Russian bureaucrat, decentralization spelt disintegration.

The Russian Revolution.—The autocratic policy of Nicholas II stimulated the extreme Left in Russia, and from 1905 to his abdication in 1917 the Revolutionary movement became continuous in purpose and direction. The first sign was the manifesto of October 30, 1905, issued by the Government, promising reforms. But repeated delays caused strikes and mutinies, and in 1906 the Czar opened the first of his Dumas or legislative assemblies. These Dumas were convened intermittently until the outbreak of the First World War.

At the outbreak of the war, Russian feeling was, on the whole, with the Tsar, patriotism proving a stronger instinct than the new doctrines of class war. If the Czarist machinery had proved competent the Revolution might have been delayed. But the old prejudices against non-Russians proved incalculably damaging, and corruption and alleged favouritism, together with bad management and inadequate food supplies, convinced even the indolent, long-suffering mujhik that the doctrinaires, such as Lenin, were not without fire to their smoke.

The Czar was obliged to abdicate (March 15, 1917)* and a Government was formed with Kerensky as its most prominent member. This was the signal for a struggle

* See Chapter LXVIII.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

between the new Government, who had the onus of the war on their shoulders, and the Bolshevik Party, who urged its immediate end. The latter party found a powerful exponent in Lenin, whose uncompromising pen and gifts of organization were of two-fold advantage to the rapidly rising fortunes of the new faction.

On September 15, 1917, the Russian Government, with Kerensky at their head, declared Russia a Republic, but two months later a *coup détat* put the offices of Government in the hands of Lenin. Henceforth the Proletariat were the most important class in Russia.

With the signing of peace, the Revolution began in earnest. An armed force under the "Cheka" was formed, and became the organizing centre of the political force and the instrument of the ensuing Red "Terror." A programme for nationalizing the industries and for dispossessing the propertied classes was straightway set on foot. Foreign intervention led to the stimulation of the Terror, amongst the first victims being the ex-Czar and his whole family. Civil war raged, the opposition being headed by a succession of leaders, Denikin and others, who were known as "Whites." The Whites, however, collapsed, war-weariness and their own incompetence contributing to their fall.

After the Revolution.—Internally, the Bolsheviks had to face serious famine problems, and, under Trotsky, they made astonishing efforts to deal with their food and transport difficulties. Out of this starving and diseased civilization there emerged the New Economic Policy and the Five Year Plan.

When Lenin died in 1924 there were two policies from which the Soviets could choose. One, the policy of Trotsky, was to further the cause of revolution in all countries with the view of shaping them all on the Communist model. This movement was known as the Comintern (or Communist International). The other policy was advocated by Stalin, who preferred, for the time being, to concentrate on the defence of the Russian revolution by a great development of the armed forces and of the industrial potential of the country. The Trotskyites were driven into exile or otherwise "liquidated," and under the banner of "Socialism in one country" the drive for industrialization began.

In 1928 the Five Year Plan, a scheme for controlling the whole economic machinery of the nation, was started under the virtual direction of Lenin's successor, Stalin.

It was an experiment without parallel. The result, according to an official statement, was an increase in production of 22 per cent. Devoted mainly to basic industries, considerable attention was given to the mass-production of weapons. Hitler had warned the world that, "When we talk today of the conquest of new territory in Europe, we can talk only of Russia and her border states." A second Five Year Plan was begun in 1933, the year in which Germany started a Four Year Plan.

LXXI

MODERN CULTURAL AND SCIENTIFIC DEVELOPMENTS

Eighteenth-Century Taste.—The character of French decorative art throughout the eighteenth century was a continuation of the Louis Quartorze style, neo-classical and flamboyant, and it strongly affected the native style of most European countries. To imitate the French was to achieve elegance. Only the Dutch refused to be influenced by foreign taste and sturdily maintained the reputation for wonderful craftsmanship and design which they had won in the seventeenth century.

Indeed, the Dutch themselves influenced contemporary taste, particularly in the passion for "chinoiserie" and "Indian" wares, largely derived from their oriental imports. Blue and white Chinese porcelain, the old Imari dishes (which served as models for the early Crown Derby designs), as well as all kinds of lacquered cabinets, indiscriminately described as "Indian," were eagerly sought by men of taste.

Perhaps the greatest demand was in England, where in the last quarter of the seventeenth and first half of the eighteenth centuries lacquered furniture was made by Anglo-Oriental craftsmen and became immensely popular. In describing the mode, Daniel Defoe* (*d.* 1731) declared that all people of fashion were "piling their china upon the tops of cabinets, scrutores and every Chymney Piece to the top of the ceilings and even setting up shelves for their Chinaware where they wanted such places, till it became a grievance in the expence of it and even injurious to their Families and Estates."

Now that Watteau was dead, and the Poussins, and Claude Lorraine, French painting lay fallow until it was brought new life by the Impressionists. In England, meanwhile, painting was struggling for recognition, but the English moneyed aristocracy adorned their houses with foreign pictures, mostly "Old Masters"† bought in Italy on the "grand tours" considered essential to the education of fashionable young men. But by 1770, portraits by English painters had become fashionable, and in the

* The author of *Robinson Crusoe* and chief among the "pamphleteers."

† And often spurious copies at that.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

applied arts also there was a demand for English work.

The change was brought about by the great increase in wealth of the mid-eighteenth century. Wealth creates the desire for elegant surroundings, and the Adam brothers, Chambers, Dance and Holland were called upon for mansions and their interior decorations, while Nash built the Regent Street Quadrant and terraces in Regent's Park. The demand of the eighteenth-century magnates called forth the furniture of Chippendale (*d.* 1779) and Sheraton (*d.* 1806), and the porcelain of Worcester, Derby and Chelsea.

Great possessions produce self-satisfaction, and self-satisfaction produces a demand for portraits. The wealthy English sat to Gainsborough (*d.* 1788) and Romney (*d.* 1802) and Reynolds (*d.* 1792). The age produced, too, that most English and prolific of painters—though he never achieved front rank eminence—George Morland (*d.* 1804). In his forty-one years he is said to have done 4,000 pictures, of inn and farmyard, stable and village green. With the increase of the prestige of art and artists it became the fashion for young ladies to learn painting. One of the most sought-after drawing-masters of the time, "Old" Crome (*d.* 1821), who imitated the Dutch, was the leader of the Norwich school, in whose style East Anglian-Dutch landscapes were also painted, at the close of the century, by Constable (*d.* 1837) and John Sell Cotman (*d.* 1842).

The development of music during this period can be only lightly touched upon. Handel and John Sebastian Bach were born within a month of each other (1685) in the same part of Saxony and both profited by the Italian methods that were then penetrating to Germany. Bach (*d.* 1750) was a member of a family which produced musicians over a period of two and a half centuries.

When the new art found symphonic expression in Haydn (*d.* 1809) and Mozart (*d.* 1791) it became music pure and simple. Beethoven (*d.* 1827), the greatest of all masters, soon showed how gigantic the scale and range of the sonata style could be, and how tremendous was its effect upon the possibilities of vocal music, both choral and operatic. Meanwhile, Mozart raised comic opera, both Italian and German, to a height which had never been approached.

The Romantic Movement.—The opening of the nineteenth century saw a new brutality in art inspired by the Revolutionary era and the Napoleonic Wars. Goya (*d.* 1828), the Spanish artist, paused in his regular work of painting magnificent portraits to produce a set of etchings that are among the tragic documents of art, while Wiertz, in Brussels, painted "Napoleon in Hell" and the picture called "Nineteenth Century Civilization," which shows a woman leaping from a window with her child in her arms while fired upon by soldiers.

There was one aspect of the "Romantic Movement," which affected music, architecture and literature, as well as painting. It is a vague term; when applied to such delightful pieces as Weber's (*d.* 1826) "Invitation to the Waltz," it seems to imply "programme music"—a characteristic of any stage in which the art is imperfectly mastered. But the movement produced such men as Schubert (*d.* 1828), the greatest of all song-writers, Schumann (*d.* 1856), Chopin (*d.* 1849), with his astounding lightness of touch and perfect balance of style, so well exemplified in his numerous "Nocturnes," and Mendelssohn (*d.* 1847), whose brilliant mastery of all branches of the art tended to discredit his work in the eyes of those who looked for slight imperfections as the infallible sign of genius.

Wagner (*d.* 1883) achieved absolute union of music and drama, but his music, though appreciated by some, has no appeal for those who cannot overlook the inherent absurdities in grand opera. Side by side with Wagner rose the Hungarian, Liszt (*d.* 1866), and it is unfortunate that these two great geniuses should have fed the fire of criticism and comparison by a paper warfare which they did everything in their power to promote. Nevertheless Liszt, as the pioneer of the symphonic poem and a great piano virtuoso, deserves to take his place beside Wagner in the Hall of Fame.

The German romantic movement opened with a series of romances or tales written in imitation of Defoe's *Robinson Crusoe*, but these are important only in so far as they prepared the way for that great universal genius, Goethe (*d.* 1832), and his friend and compatriot, Schiller (*d.* 1805). Goethe was supreme as a lyric poet; a modern writer says of him, "he was a sort of emperor or high priest of letters, wielding a European supremacy like that which Voltaire had held before him, and such as nobody, except perhaps Victor Hugo, has since."* Many of his prose writings have an autobiographical interest.

In Britain the most "romantic" figure was that of Sir Walter Scott (*d.* 1832), whose "Border Minstrelsy," ballads and novels are all typical of the revolt against the artificiality of Pope and his school, and whose stirring "picaresque" tales leaped into immediate popularity. Wordsworth and Coleridge were the poets who gave

* Morris, *History of Europe*, p. 466.

CC-0 In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

philosophic expression to the new spirit in poetry. Other "romantic" figures were the poets Byron, Shelley and Keats, who all died in the flush of youth. Each represented a different aspect of romanticism. Charles Dickens (*d.* 1870), the great and prolific novelist, belongs to the later Romantics. In the Anglo-Italian Rossetti is found the link between the poets of this time and those painters who styled themselves "Pre-Raphaelites." In 1848 a group of artists, among them Rossetti, decided to imbue their pictures with the early Renaissance spirit. The "Pre-Raphaelites" set out to defeat the camera by attempting to rival its unselecting vision, and "by going," as Ruskin (*d.* 1900) urged them, "to nature, respecting nothing, selecting nothing and scorning nothing." The ideals of the brotherhood, which also included Millais and Holman Hunt, were at first ridiculed, but eventually the tide turned, and their style attained a great vogue. It merged later into a new phase, known as the Aesthetic Movement, more aloof from life and attracted by an imaginary mediaevalism. In this movement Burne-Jones and William Morris were prominent.

The Impressionists and Post-Impressionists.—After the fall of Napoleon, the annual exhibitions at the Paris "Salon" became the central point of focus of French art, while the general public became patrons. All through the century there was a prolonged battle between the "classicists," followers of Poussin, and the "individualists," the spiritual heirs of Rembrandt. Curiously enough, an Englishman, Turner (*d.* 1851), is the link between them, and his work had a great effect upon those painters known as "Impressionists."

These never formed a band, like the Pre-Raphaelites, but worked as individuals, each observing directly from nature and painting what he felt to be essential, recording what he saw at the moment of vision, not what his reason told him existed. The impressionists aimed at reproducing, by any means which suggested itself, the transitory effects of sunshine, or cloud, or mist, or some strange effect of broken light. They made the important discovery that shadows are not merely absence of light, but have the complementary colour of the light on the object casting the shadow. Some believed that only pure unmixed colour should be used.

One of the earliest of these impressionists was Corot (*d.* 1875), whose delicate ethereal landscapes show this movement at its beginning. Manet (*d.* 1883) followed, and Degas (*d.* 1917) and Renoir (*d.* 1919) used rich and glorious colour, but the detail of their pictures was subordinated to the general shape or design, and anything which did not go into the pattern was ruthlessly omitted. Cézanne carried this still further; his pictures are elaborately simple and the colour is made to do the work of modelling and light and shade.

The Dutchman, Vincent van Gogh (*d.* 1890), also used colour in this way, but he depended on brushwork too for his effects, trying to render the very texture of things. Gauguin (*d.* 1903) also used pure colour; he went to live in the South Seas and painted natives and tropical landscapes with vivid brilliance. He has had a very great effect upon modern poster design. Some painters went further still, and produced picture puzzles (not to be confused with the "problem" pictures popular in the 'eighties) which might have any meaning or none. Later movements originating in France were the Fauvist, the Cubist and the Futurist, all claiming freedom to shake off the restraint of natural laws, and even to go beyond the traditional province of painting in their efforts to express the subconscious. Surrealism has been defined as "representation of nature through the medium of the sub-conscious."

As in art, so in literature. The end of the nineteenth and beginning of this century have seen a movement away from romanticism and towards realism. The French novel, traced through Balzac (*d.* 1850) and Flaubert (*d.* 1880) to Daudet (*d.* 1897), Loti (*d.* 1923), Zola (*d.* 1902) and Anatole France (*d.* 1924), has moved far from the romances of Victor Hugo (*d.* 1885) and is still the model for modern artistic style. The Italian writer Pirandello created a theatre of his own in Rome (1925), where he produced and experimented at will. His work met with great response, and has been translated into fifteen languages. In philosophy, too, the greatest thinkers, Bergson (*d.* 1941) and Croce, were essentially experimentalists. George Santayana discoursed on metaphysics with deep poetic feeling.

In architecture, too, the days of the "Gothic Revival" inaugurated by Viollet-le-Duc (*d.* 1879) and fostered by Ruskin are long past. The new style is still in the experimental stage of eclecticism, but the general tendency is towards boldness and simplicity of line and is sparing in ornament. The word Functionalism was coined to express the idea of an architectural design which has the economy and precision of engineering, perfectly adapted to the purposes it has to serve and using imagination only within the limits of utility. The best-known of the protagonists of this new style was the Frenchman, Le Corbusier.

During the greater part of the nineteenth century, theatrical art was singularly uninspired; the age was rather that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the novel. The last two decades brought a revival, when in Norway Ibsen started a revolutionary movement in drama by writing plays, realistically produced, whose themes were concerned with urgent social and psychological problems, using material drawn from the lives of ordinary people. In Russia Chekhov's plays showed a similar tendency. Bernard Shaw in England developed the play of ideas, and turned drama into a vehicle for social propaganda. The appeal was principally to the middle class. The repertory theatre also began to influence the taste of the public in the direction of serious drama; notable experiments were the Abbey Theatre in Dublin and the New York City Theatre Guild. In Soviet Russia the drama and ballet became the representative folk arts, and a recognized propaganda medium.

Notwithstanding the note of modernism in the theatre, it lost ground rapidly in competition with the cinema, which in the period between the two world wars grew to be the greatest provider of popular entertainment over the whole globe. Though Great Britain was at first to the front in film production, the initiative during the First World War passed to the United States, where in Hollywood, California, the industry developed enormously. In 1928 the practicability of synchronizing sound with motion was demonstrated and the "talkie-film" was born. A still further development was the colour film. The cinema became unequalled in its power of disseminating ideas and information, and even became useful in some branches of scientific research.

Another oustanding achievement of the technological age is wireless telephony, the scientific device on which broadcasting is based. In 1902 the first radio message was flashed across the Atlantic. Twenty years later regular broadcast programmes of music and news began to be sent out from the London station, and in a very short space of time radio-transmission had linked up the peoples of the world into a single community of listeners. In order to obviate interference, an international organization was set up to allocate distinct wave-lengths to the various national systems of radio. The governments of the world quickly realized that control of wireless transmission was a potent instrument of authority, and radio became in most countries either a state-owned or a state-controlled industry whose value for propaganda was measureless. Its importance was realized to the full during the Second World War, when alongside the conflict of arms there was waged over the air a conflict of ideas ("the ideological war").

A later development was television, whereby not only sound effects but scenes could be conveyed and reproduced for the private viewer on his television set.

No account of the technological inventions which have so completely altered the perspective of our lives during recent times would be complete without reference to the aeroplane. Leonardo da Vinci, the Renaissance artist and scholar, deduced some of the laws of flight from the observation of birds and envisaged the possibility of flying in heavier-than-air machines. Many bold and ingenious experiments during the nineteenth century led up to those of the Wright brothers in North Carolina, where in 1903 they achieved flights up to twenty miles. Then the crossing of the English Channel in 1909 by Blériot in his monoplane captured the popular imagination in Britain with the striking proof which it brought of the practical possibilities of aviation. Only ten years later two British flyers, Alcock and Brown, spanned the Atlantic by direct flight. In 1947 a round-the-world trip was accomplished by an American in little over two days. Now the construction of jet-propelled aircraft has made possible a speed greater than that of sound.

War has always stimulated invention, and it is not surprising that in the feverish activity of research during the Second World War advances of great moment should have been made. These have contributed to the purposes of peace as well as those of war. Universal shortages led to the production of substitute materials on a large scale, synthetic foods, fabrics, plastics, medicaments and so forth, adding hundreds of new articles of use to the resources of mankind.

More dramatic in its possibilities for better and for worse was the discovery of the secret of the release of the energy stored up in the atom. The study of the behaviour of radium, an element discovered by Professor and Madame Curie in France in 1898, yielded results which transformed the science of chemistry by showing that the elements, so long supposed to be unchangeable, could be transmuted into other elements. In the process of change, brought about by the radiations emitted by radio-active substances such as uranium, vast quantities of energy were released. The discovery was comparable in its implications to the discovery of fire by palæolithic man.

The atomic bombs released by the Americans on the Japanese* burst with shattering force not only on their unfortunate cities, but also in the minds and imaginations of mankind. In the scientific laboratories of the world there were seen to

* See Chapter LXXII

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be possibilities of the control of energy sufficient to make obsolete the whole apparatus of war as hitherto understood, as well as to relieve mankind of much heavy labour. The question, however, remained whether atomic energy directed to destruction would shatter human society before the same energy, used for constructive purposes, could be utilized in an era of peace and plenty.

The United Nations set up an Atomic Energy Commission to discuss the international control of this new force in the interests of humanity. The problem was a difficult one, because control could be effective only if the nations submitted to the fullest inspection, and such inspection by an international body involved a certain sacrifice of sovereign rights. Russia refused to countenance inspection, and insisted that the first step was to destroy all existing atomic plants and bombs. The situation was fraught with the greatest danger, partly because it so easily gave rise to fears and suspicions.

LXXII

THE SECOND WORLD WAR

An Armed Truce.—It soon became evident to those who did not indulge in wishful thinking that the Treaty of Versailles was no more than an armed truce. The failure of Germany to fulfil her obligations led to the French occupation of the Ruhr. Soldiers of the disbanded German regular army enlisted in so-called volunteer corps, and conscription was revived in 1935.

In France the Maginot Line, a series of "impregnable" fortifications, extending from near Basle to the border of Luxemburg, was built between 1927 and 1935. Germany answered with the Siegfried Line, running more or less parallel with the rival system. Most European nations, including Russia, multiplied their armaments. The German aircraft industry was revived, and in 1935 Hermann Goering, as Air Minister, proudly announced that the Luftwaffe had a large fleet of planes. In the same year Britain, bent on appeasement, signed a Naval Treaty that enabled Germany to maintain a fleet equal to 35 per cent of any class of tonnage in the British Navy other than submarines, in which the ratio was 45 per cent. Germany undertook not to use her U-boats for unrestricted warfare.

Hitler Becomes President.—Hitler had succeeded Hindenburg on his death in 1934, following a "blood bath" in which hundreds of Nazi supporters had been murdered. A rising in Vienna, abetted by Germany, was responsible for the assassination of Engelbert Dollfuss, the Austrian Chancellor, but was abortive because Mussolini rushed 40,000 troops to the Brenner Pass. Thwarted in Austria, Hitler's troops reoccupied the Rhineland in March, 1936. Settling their differences, the two aggrieved Powers formed a political pact known as the Axis. They lent active support to Franco in the Spanish Civil War. His opponents were aided in like manner by Russia and France.

Italy declared her neutrality when Austria was occupied by Germany in 1938. The complete success of his gamble convinced Hitler of the "decadence" of the western democracies and emboldened him in the spring of 1938 to the absorption of Austria into the German Reich. A pretext was easily found, and without warning German troops were hurled across the frontier, covered by an imposing force of bombing aeroplanes. There was no opposition and Hitler claimed that he was hailed as a liberator. A demand for the cession of the Sudeten areas of Czechoslovakia to Germany, backed by the mobilization of the Nazi Army, was regarded as so serious a menace to the peace of Europe that Neville Chamberlain, the British Prime Minister, flew to Munich to discuss the matter with the Fuehrer. The upshot of the negotiations, in which France and Italy joined, was that Germany was given territory within the frontiers of Bohemia and Moravia. Chamberlain returned, waving a paper bearing Hitler's signature and announcing "peace in our time." This document, which soon proved to be utterly worthless, was dated September 30, 1938. In March, 1939, Memel Territory, on the Baltic, and what remained of Czechoslovakia were seized by Germany. Italy occupied Albania in the following month.

Broken Promises. — Britain shook off something of her lethargy. The conscription of youths of twenty to twenty-one years of age became law. The partners of the Axis agreed to mutual military support. It was obvious that Danzig, a free city under the protection of the League of Nations, was likely to be the scene of Hitler's next act of aggression. In this Poland was primarily interested because she had the use of all waterways and railways. Strained relations, aggravated by the building of the rival Polish port of Gdynia, approached breaking point. Germany was warned that if she attempted to seize the Free City of Danzig, Poland would resist. The Reich and Russia came to an understanding that neither would attack the other; an Anglo-Polish Pact was signed. On September 1, 1939, the Nazis invaded Poland. As a result, two days later Great Britain and France declared war on Germany. The Second World War had begun.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

War on Civilians.—The Germans sought to undermine morale by bombing and terrorizing civilians. In a series of pincer movements which enveloped the Polish armies, Warsaw surrendered after being reduced to a shambles. The last garrison, that of Gdynia, fell on October 1. Russia, which had moved many divisions across the eastern frontier, shared in the spoils by annexing White Russia and Ukrainian Galicia. No practical help had been given by the Allies. Britain's first air raid on Germany was to drop tons of leaflets announcing that she was prepared to make peace with "any peace-loving Government in Germany."

Some 158,000 men of the British Expeditionary Force under General Viscount Gort were in France within five weeks. The supreme commander of the French was General Gamelin, whose one obsession was "Defence." After a very slight advance in the neighbourhood of Saarbrücken, his troops were thrown back, and a period of what was called "phoney" war ensued with the Germans sheltering in the Siegfried Line and the French in the Maginot Line. Meanwhile, Russia invaded Finland in November, 1939. Marshal Mannerheim surrendered in March, 1940, after an heroic defence against overwhelming numbers, and much Finnish territory was seized by the Soviet.

Hitler made the next dramatic move. In April he struck at Denmark and Norway, each a neutral democracy. Britain sent to Norway a handful of men, who fought with consummate bravery for a fortnight and were withdrawn. On May 10, the day on which Mr. Winston Churchill assumed office as Prime Minister and Minister of Defence, Nazi hordes streamed into Holland, Belgium and Luxemburg. The Netherlands held out for five days.

In Belgium the Germans isolated the northern armies. King Leopold ordered his troops to cease fighting, but not before warning his allies. Weygand, placed in command, failed to stop the onslaught. His front was broken at Sedan and on the Meuse. The Channel ports fell, but the British clung grimly to Dunkirk. Over 1,000 naval ships, merchantmen, excursion steamers, private yachts, almost anything that would float, crossed the Channel and returned with more than 335,000 troops.

It was significant that combats were named after countries rather than places. "The Battle of France has begun," Weygand told his troops on June 5. The French and British who remained failed to stem the tide. Paris was entered by the Germans on June 14. Mussolini now declared war. A Franco-British Union was refused. Marshal Pétain counselled the signing of an armistice, whereby the Germans secured the whole of western France as a zone of occupation. Britain stood alone.

Hitler's plan for the conquest of the island was put into operation by U-boat and plane. Between August 8 and October 31 the aerial Battle of Britain raged in fury. Its end marked a turning point in the war. Although 13,281 people, mainly civilians, were killed and 20,325 injured, and thousands of houses were blasted or burned down, many German aircraft were destroyed in daylight. This cost the gallant defenders severe casualties. Craft ready for the invasion of England by sea were destroyed by British bombers.

While preparing to march on Egypt from Libya, Mussolini attacked Greece without warning. The Italians suffered severe losses when the Fleet Air Arm struck at their main battle fleet at Taranto and General Wavell routed the Italian Army in North Africa.

Downfall of Greece.—The Greeks put up so fine a fight that Hitler was compelled to send German divisions to the aid of his ally, who was already losing Abyssinia. Depleted of men and arms by Britain's determination to stand by the side of Greece, Wavell was unable to withstand the pressure brought to bear on him, with the result that most of the territory he had won had to be evacuated. As a consequence of another successful lightning campaign by the German land and air forces, Yugoslavia was speedily overrun, as was Greece. At the end of April the British embarked for Crete. Attacked by airborne troops, they lost the island after less than a fortnight of savage conflict.

The drive eastward, furthered by the collaboration of Rumania and Bulgaria, had repercussions in Iraq, Syria and Persia (Iran). Dealt with firmly, Nazi intrigue in these directions was brought to naught. Hitler, his ambition now centred on Russia, had hoped to outflank that vast country on her Caucasian border and secure the much-coveted Baku oil supply. Thwarted in this, on June 22, 1941, he launched attacks extending from the shores of the Baltic to those of the Black Sea.

It was to be a *blitzkrieg*, a lightning stroke. The Russian line bent but failed to break. As the Red Army receded it burned everything of use to the enemy. Instead of loot they found scorched earth. Guerrilla bands got to work in the rear and on the flanks of the Nazi troops. Finland threw in her lot with Germany. Hungary, placated by the restoration of her Transylvanian territory, supplied soldiers. Britain allied herself with Stalin.

Japan Enters the Struggle.—In Decem-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ber, 1941, Japan, now a member of the Axis, treacherously attacked the American naval base of Pearl Harbour, in the Hawaiian Islands, invaded Malaya, and landed on the Philippines. Britain and the United States made common cause, but 1942 was not propitious for the Allies. Burma, Malaya, the Philippines, the Dutch East Indies and many a Pacific outpost fell to the Japanese, though notable victories were scored in battles in the Coral Sea and off Midway Island. In North Africa Rommel was driven out of Egypt and Cyrenaica, while British and American troops landed in Algeria and Morocco. The Axis forces in North Africa surrendered in May, 1943.

The Allied invasion of Sicily and of the mainland of Italy was followed by the downfall of Mussolini and his surrender, though fighting continued against the Germans in the peninsula. Meanwhile, the Russians had opened an offensive which regained many of their cities and much territory. In the Pacific theatre the Japanese were held. The outstanding event of 1944 was D-Day (June 6), when British, Canadian and United States troops landed in Normandy, under the supreme command of General D. D. Eisenhower. They liberated most of France and Belgium and part of the Netherlands. Aachen, the first important German city to fall, surrendered on October 21. In a quick-moving counter-attack, the Germans made deep penetration towards the Meuse, to be flung back early in 1945, when the Russians captured Budapest and approached Berlin, while MacArthur landed in the Philippines.

Burma, invaded by the Japanese, was finally cleared of the enemy after a gruelling campaign waged against foes, fever and climate. Germany's armed forces made an unconditional surrender on May 7; Japan gave up the struggle on August 14, following the dropping of atomic bombs on Hiroshima and Nagasaki and the crossing of the Manchurian and Korean frontiers by Russia. "Mopping-up" continued in various territories, but to all intents and purposes the Second World War was over.

United Nations.—Hope for the future was centred on the fulfilment of the Charter of the United Nations, to which representatives of fifty nations attached their signatures at San Francisco on June 26, 1945, "determined to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind, and to re-affirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women and of nations large and small; and to establish conditions under which justice and respect for the obligations arising from treaties and other sources of international law can be maintained; and to promote social progress and better standards of life in larger freedom; and for these ends to practise tolerance and live together in peace with one another as good neighbours; and to unite our strength to maintain international peace and security; to ensure, by the acceptance of principles and the institution of methods, that armed force shall not be used, save in the common interest; and to employ international machinery for the promotion of the economic and social advancement of all peoples."

The principal organs of the United Nations are the General Assembly of all the Vested States, a Security Council to act as a watchdog over the peace of the world, an Economic and Social Council, a Trusteeship Council, an International Court of Justice and a Secretariat or international civil service.

LXXIII
THE POST-WAR WORLD

THE impact of the war on the nations varied considerably, and the net result was to bring about a greatly changed balance of political and economic strength. The cities and industrial regions of Central Europe had been reduced to a shambles. The devastation was such as had not been known since the end of the Thirty Years' War in the seventeenth century—perhaps not even then. Russia, too, had suffered heavily in the territories which had been fought over. At the other end of the scale, America had been spared material damage, and shared this immunity with the states which had remained neutral.

Great Britain used up her treasure in complete abandonment to the task of winning the war. For a year she had borne the burden alone, and had not hesitated to call in the greater part of her foreign investments, as well as to load herself with unprecedented taxation in order to pay for the war. In consequence she ceased to be a creditor country, and soon owed large sums to the nations on whose behalf, as well as her own, she was fighting. It would not have been possible to continue for long in this way had not President Roosevelt in 1941, while his government was still technically neutral, come to the aid of the Allies with the scheme of Lend-Lease which, in effect, placed the industrial resources of the U.S.A. at their disposal without stint. The manufacturing strength of the United States, now the arsenal of the Allies, was thus built up to an enormous potential, and when the time came to turn from the making of weapons to supplying

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the requirements of normal life, her competitive power in the markets of the world was overwhelming. Lend-Lease was ended, but the United States had great surpluses of raw materials and manufactured articles to dispose of. Yet there was one great obstacle: the nations which needed these surpluses most in order to rehabilitate themselves had no means of paying for them. In the long run imports can be paid for only by exports, and the nations either had nothing to export, or, if they had, their exports were mostly not wanted by the United States. The "dollar crisis" came to a head in the summer of 1947, and led to the intensification of controls on industry and personal consumption in order to reduce the demand for American goods. Great Britain met the situation by drastically reducing the standards of consumption of the people, and by diverting industry as far as possible to production for the export market rather than for home consumption.

The economic *malaise* of the post-war world was aggravated by the political *malaise*. While the fighting was still going on meetings had been held at various times between the leaders in order to define the aims of the Allies and the principles on which the peace of the new world was to be erected. In 1941 Roosevelt and Churchill met at sea and issued a proclamation, known as the Atlantic Charter, which set out the principles of democratic government on which their hopes for the world were based: "a rough-and-ready, war-time statement of the goal." In 1943 at Moscow representatives of the U.S.A., Russia, Great Britain and China signed the Moscow Declaration, which foreshadowed the creation of a new international organization to replace the League of Nations. In the following year, at Dumbarton Oaks in the U.S.A., further progress was made, and the project endorsed at Yalta in the Crimea (February, 1945) by Roosevelt, Churchill and Stalin.

On the surface of things, there appeared to be a hopeful measure of agreement as to what was implied by the victory of the Allies over Fascism and Nazism. The Potsdam Conference after the capitulation in the summer of 1945 defined what were to be "the political and economic principles to govern the treatment of Germany in the initial control period." One of those principles was "the eventual reconstruction of German political life on a democratic basis," implying that, notwithstanding the division of Germany into zones of occupation for immediate controls, Germany would eventually emerge as a single state to take her place again as a fully sovereign member of the comity of nations.

Within a few months of this declaration, Europe was rent asunder into two regions along the line of the River Elbe and beyond. On the eastern side, in the Russian zone, behind an impenetrable barrier ("the iron curtain") life was organized according to the Soviet totalitarian conception of "democracy"—"the dictatorship of the proletariat"; while on the western side, in the American, British and French zones, administration was governed by conceptions of liberal democracy. The error involved in making "democracy" the battle cry was thus exposed. Every effort made during 1946 and 1947 to find a basis for the peace settlement was destined to failure because the parties accused each other of departing from the Potsdam agreement. In 1948, the Americans, the British and the French decided to proceed with the making of a peace treaty with Germany in respect of the territories occupied by them, without prejudice to the inclusion of the Russian zone at some future time. Only in this way did it seem possible to the Western powers to make any progress, seeing that most of the purposes which it was hoped to achieve through the United Nations were brought to naught through the continued exercise of the "veto" by the Russian representatives.

The schism which divided Europe was a great obstacle to economic recovery in Germany and Austria. The pre-war industrial populations were largely fed from the food-producing areas in the eastern provinces. These being now in the Russian Zone, the food had to be imported from overseas, for the most part at the cost of the British and American taxpayer, since German industrial production was not on a scale sufficient to balance imports. The British were faced with the difficult choice of using the scarce dollars available for buying American food either to improve their own meagre rations or, by improving the German and Austrian standards, to make it possible for the industries of the western zones to pay for necessary imports.

While Russia's unaccommodating policy delayed European recovery in the West, she followed a vigorous political campaign in the East in order to ensure that she was surrounded by a ring of governments which, if not fully merged in the Soviet Union, were at least under her control. The gains of territory which the war had brought to Russia were enormous. They included the whole of the Baltic republics of Latvia, Lithuania and Estonia, a large part of Polish territory on the eastern marches, and portions of Finland, East Prussia and Czechoslovakia. In Bulgaria, Rumania, Yugoslavia, Hungary, Albania, satellite states had been created with Communist

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

governments. In 1948 the Communists, with a threat of force, overthrew the balanced administration which Dr. Benes had built up in Czechoslovakia, and swung the country over towards Russia, while repudiating all the Western influences on her political life. The pressure of Communism similarly threatened the foundations of parliamentary democracy in Greece, Italy and France.

It was in view of the danger to social democracy on the basis of free representative institutions as understood in the West that the plan for American aid on behalf of the almost bankrupt governments of Europe was proposed (the "Marshall Plan").

In November, 1947, the European Recovery Programme was approved in the Congress of the United States, and short-term help became immediately available for France, Italy, Austria and China. Altogether sixteen nations of Europe accepted the conditions which governed the grants, but those which had aligned themselves politically with Soviet Russia refused the aid which was offered.

The growing tension between East and West entered into an acute phase after the Czechoslovakian *coup d'état*. Civil war was raging in Greece between the government forces and Communist insurgents, and in Italy, France and Finland the stability of the constitutional régimes was threatened. Five of the western nations, fearing the further advance of Communism towards the Atlantic, banded together for regional protection, and in March, 1948, a fifty-year treaty was concluded, the signatories being France, Great Britain, Belgium, Holland and Luxemburg. These formed a Western Union and, reaffirming their faith in certain fundamental human rights, set up machinery for joint consultation on economic, social and cultural matters, and particularly for the co-ordination of their defence policies. The pact was not exclusive, and the door was left open for the entry of other countries wishing to preserve their own constitutional liberties and ready to help others to do so.

The "blockade" of western Berlin during 1948 embittered international relations. Cutting off communications by rail and road, the Soviets left only the air route for the supply of necessities to the western sectors. At first "technical difficulties," later the defence of Soviet economy threatened by the new western currency, were advanced as reasons. Protests were unavailing and negotiations came to nothing. Finally, the Security Council, on appeal, supported the western view, although the Russian veto prevented the adoption of a resolution declaring that peace was threatened. The crisis hastened measures of defence, and a proposal for a North Atlantic pact for mutual protection was encouraged by the unexpected re-election of Harry Truman as President of the U.S.A.

The British Commonwealth of Nations.—The progress of the British Dominions towards self-reliant nationhood was enormously accelerated by their outstanding contribution to victory in the First World War. They attended the Peace Conference in Paris as equals, and then began to appoint their own diplomatic representatives in foreign capitals. In 1926 their new status was recognized. They became "autonomous communities within the Empire, equal in status, in no way subordinate one to another . . . though united by a common allegiance to the Crown." The Statute of Westminster, incorporating this new status as law, was passed in 1931.

While thus the great societies of peoples in Canada, Australia, New Zealand and South Africa were following a peaceful evolution, the people of Southern Ireland trod the path of revolution. In 1916 a rebellion took place with a republic as the goal, and the Sinn Fein party carried on the movement. Looting and cattle-maiming, even arson and murder, destroyed social order, and the efforts of the British Government to deal with the guerrillas by sending troops to Ireland only added fuel to the fire. The Republic was proclaimed in 1919 with de Valera as President. In 1921 Dominion status for Southern Ireland under the title of the Irish Free State was granted by the British. This did not go far enough for the uncompromising Republican Party, who wanted to cut off all connexion with Great Britain. The more moderate party under Cosgrave was defeated at the polls, and de Valera proceeded to make the secession a reality and to agitate against the partition of the country.

On the outbreak of the Second World War, Eire (as the new republic was called) declared itself neutral, and her neutrality was scrupulously respected by Britain. Meanwhile Northern Ireland, or Ulster, remained true to her traditional loyalty to the Crown and played a most important rôle in the war. The distant Dominions entered the war of their free choice, the only hesitation being in the Union of South Africa, where a strong nationalist party was for keeping aloof. The services rendered to the allied cause by the Dominions were again of incalculable value, and no important decision of policy affecting external relations was taken without their being brought into the fullest consultation.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

While the First World War was in progress, the Montagu Declaration (1917) laid down as British policy "the progressive realization of responsible government in British India." This had been long implicit in the dealings of the British Government with the people of India, but the time was now ripe for a positive advance. Reforms followed under a transitional system known as "dyarchy," whereby some functions of government were transferred completely to Indian ministers while others (e.g. defence) were retained by the British. After a series of round-table conferences in 1935, further steps were taken in the direction of provincial self-government. Unfortunately, communal tension between Hindus and Moslems stood in the way of complete success. A body of opinion in Britain was prepared to grant full independence to India, but wanted to be reassured that this would not be attended by communal violence.

Every effort was made to find a workable basis for unity, so that the transfer of power might be affected harmoniously. In 1946 a British Cabinet Mission went to India for consultations, but returned without finding any assurance that a compromise could be reached between the Congress Party, mainly Hindu, claiming to speak for India as a whole, and the Pakistan Party, insisting on a separate Moslem State.

As no accommodation seemed likely between these two points of view, a date (June, 1948) was fixed by the British Government, when the suzerainty of Britain over India would be abolished without condition, leaving the two parties in India to find their own solution to the communal problem. Since the unity demanded by one and the partition demanded by the other were logically incompatible, one side must either yield voluntarily or be forced to do so after civil war. Finally agreement was reached on the basis of a partition of India, and was embodied in the Indian Independence Act of 1947. The diplomacy of Lord Mountbatten resulted in the creation of two Dominions, namely respectively India and Pakistan, each able to sever the imperial connexion with Britain at any time. A third new Dominion created at this period was that of Ceylon.

It was inevitable that there should be in both India and Pakistan considerable minorities of Moslems and Hindus respectively, and communal troubles broke out in many areas, leading to mass migrations. Gandhi, appealing for unity, undertook a fast, which had the effect of easing the tension, but he was assassinated in February, 1948. Nevertheless, his influence persisted, and a quieter atmosphere prevailed. Difficult problems arose in some of the princely states, such as Hyderabad, which was overrun by Indian troops although its rulers wished to retain their traditional British connexion.

Palestine.—In 1923 the administration of Palestine was mandated by the League of Nations to Great Britain. The mandate was carried out in the spirit of the Balfour Declaration of 1917, favouring the establishment in Palestine of a "national home for the Jewish people" with due regard to the civil and religious rights of the Arab population. The rate of Jewish immigration was carefully controlled, but during and after the Second World War there was a great movement of illegal immigration, which aroused fierce opposition among the Arabs. The burden of maintaining order in the face of recurrent outbreaks of violence became in the end heavier than Great Britain was prepared to shoulder without help from the United Nations. A date was fixed for the surrender of the mandate, and a proposal for a partition of Palestinian territory was adopted. But neither Jews nor Arabs were prepared to consider partition; at the same time the United Nations were not prepared to use force to impose partition. The mandate was finally surrendered in May, 1948, and the British troops withdrawn. Thereupon the Jews proclaimed an independent state of Israel, and civil war broke out, the Arabs receiving support from Egypt, Syria and Transjordan.

The Far East.—In the Far East, recovery after the Second World War proved to be as slow and painful as in the West. The bright hopes which lifted up the hearts of the Chinese people after the defeat of Japan soon faded, for foreign war gave place to civil war. There was at first an uneasy truce between the National Government (Kuomintang) and the Communist rebel government (controlling nearly one-third of the population), but growing bitterness led in the spring of 1947 to open war, fought over widely scattered fronts. Inefficiency and perhaps corruption, in a period of rapid inflation of the currency, brought it about that over three-quarters of the budget of the National Government was spent for military purposes, notwithstanding the fact that American arms (including the vast surpluses left at the close of the Japanese war) were turned over for its use. The question at issue was the survival of China as a nation. The dangers were both internal and external. For while it seemed at the best that China might suffer partition along Communist and anti-Communist lines, she also stood in the line of a potential clash between the U.S.S.R. and the U.S.A.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DICTIONARY OF DATES AND EVENTS

Important Happenings in the History of the World

Dates are the guideposts along the many and devious paths of history. Below there are many of the important events in the progress of mankind that have been recorded. It must be remembered that many happenings in early times are still being investigated by scientists, and it is quite probable that man had been on the earth for a very long period of time before he had learned how to register, in even the crudest way, anything that occurred. When a date is uncertain the abbreviation *c.*, denoting *circa* (about), is used.

B.C.

c. 3000 Beginning of written record of events in Egypt and Babylonia.
c. 2500 Old Kingdom in Egypt: Age of the Pyramids.
c. 2350 First Babylonian empire won by Sargon of Agade.
c. 2000 Middle Kingdom in Egypt.
c. 1750 Hammurabi, King of Babylon: his code of laws.
c. 1650 Cretan civilization at its height: the palace at Knossos.
c. 1500 New Kingdom in Egypt: Thothmes III.
c. 1350 Hittite empire in Asia Minor and North Syria.
c. 1250 Rameses II, King of Egypt.
c. 1190 The Trojan War.
c. 1100 Tiglath-pileser I extended the power of Assyria.
c. 1100 Dorian invasion of Greece.
c. 1000 Death of King David.
933 Death of Solomon.
933 Foundation of Kingdoms of Judah and Israel.
753 Traditional date of foundation of Rome by Romulus.
612 Destruction of Nineveh, capital of Assyria, by the Medes and Chaldeans.
c. 600 Marseilles (Massalia) founded by Greek settlers from Asia Minor.
c. 624 Birth of Gautama, the Buddha.
586 Jerusalem taken by Nebuchadnezzar; captivity of the Jewish people in Babylon.
586–573 Siege of Tyre by Nebuchadnezzar II.
560 Peisistratus became Tyrant of Athens and founder of the city's greatness.
550 Birth of Confucius, Chinese reformer and philosopher.
538 Babylon conquered by the Persians.
510 Republic in Rome established.
494 Plebeians of Rome seceded.
492 Darius of Persia invaded Greece.
490 Battle of Marathon: defeat of Persians by Greeks.
481 Xerxes of Persia invaded Greece.
480 Naval battle of Salamis: defeat of Persians by Greeks.
447–432 Building of the Parthenon at Athens.
431–404 Peloponnesian War between Athens and Sparta.
399 Death of Socrates.
322 Death of Aristotle.
336 Accession of Alexander the Great, King of Macedonia.
332 Foundation of Alexandria by Alexander the Great.
331 Defeat of Darius, King of Persia, by Alexander the Great at Arbela.
327 Alexander the Great reached the Hydaspes River (Jhelam), in the Punjab.
323 Death of Alexander the Great at Babylon.
264–241 First Punic War between the Carthaginians and the Romans.
224 The Colossus of Rhodes (statue of Apollo) destroyed by an earthquake.
219 Hannibal crossed the Alps and invaded Italy.
218 Second Punic War.
212 Death of Archimedes, Greek mathematician, at siege of Syracuse.
149 Third Punic War.
146 Corinth burned by the Romans.
146 Destruction of Carthage by the Romans.
142 Independence of Judea won by the Maccabees.
100 Julius Cæsar born.
70 Virgil born.
65 Horace born.
63 Damascus taken by the Romans.
55 First invasion of Britain by Julius Cæsar.
47 Julius Cæsar occupied Alexandria.
44 Julius Cæsar murdered.
43 Cicero put to death.
31 Battle of Actium: end of the Roman Republic.
31 Octavian (Augustus) first Roman Emperor.
30 Death of Cleopatra: Egypt a Roman province.
19 Virgil died.
c. 4 Birth of Christ.

A.D.

43 Aulus Plautius led an expedition against Britain.
54 Nero became Emperor of Rome.
60 Revolt of Boadicea.
61 Iceland discovered by Northmen.
64 Beginning of the persecution of Christians under Nero.
70 Jerusalem destroyed by the Romans under Titus.
79 Destruction of Pompeii.
c. 122 Hadrian's Wall, from the Tyne (Wallsend) to Solway Firth (Bowness), begun.
c. 300 Armenian Church founded.
303 Beginning of the final persecution of Christians under Diocletian.
305 St. Anthony established the first monastery in the Fayum, Egypt.
324 Constantine the Great Emperor of East and West.
Christianity became the state religion of the Roman Empire.
330 Constantinople founded by Constantine.
375–800 The Dark Ages.
378 Defeat of the Emperor Valens by the Visigoths near Adrianople.
395 Death of Theodosius I, last ruler of the united Roman Empire.
410 Alaric captured Rome and sacked the city.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.D.	
449	Hengist and Horsa invaded Britain.
527	Justinian I became Emperor of the East.
c. 530	Order of the Benedictines established.
553	Justinian Code.
563	St. Columba settled in Iona.
568	Lombards invaded Italy.
c. 570	Birth of Mohammed.
590	Gregory the Great becomes Pope.
597	St. Augustine landed in Thanet.
632	Death of Mohammed.
641	Arab conquest of Alexandria.
664	Synod of Whitby.
680	Cædmon, first English Christian poet, died.
682	Mauretania (Morocco) seized by the Mohammedans.
711	Moors from northern Africa invaded Spain.
712	Seville captured by the Moors.
718	Mission of Boniface to Germany.
732	Battle of Tours: Mohammedan invasion of France checked by Charles Martel.
c. 789	First raid on England by the Danes.
800	Charlemagne, King of the Franks, became Emperor of the West and founded the Holy Roman Empire.
843	Partition of the Western Empire.
866	Danes invaded East Anglia.
878	Danes defeated at Ethandune by Alfred the Great.
910	Abbey of Cluny founded.
c. 985	Greenland discovered by Eric the Red, Norwegian.
c. 1000	North America (Vinland) discovered by Leif Ericsson.
1016	Knut of Denmark became King of England.
1054	The Great Schism between the Roman Church and the Greek Church.
1066	William of Normandy conquered England.
1072	William the Conqueror invaded France.
1078	Hastings, Sandwich, Dover, Romney and Hythe established as the Cinque Ports for providing ships for naval purposes.
1086	Domesday Book begun.
1090	Normans conquered Sicily.
1096	First Crusade.
1099	Jerusalem captured by Crusaders.
1138	Battle of the Standard: Scots defeated.
1154	Adrian IV, the only Englishman to wear the triple tiara, elected Pope.
c. 1167	Oxford University founded.
1169	Eruption of Mt. Etna: Catania destroyed.
1170	Becket murdered in Canterbury Cathedral.
1187	Jerusalem captured by Saladin.
1191	Capture of Acre by Richard I.
1204	Loss of Normandy by King John.
c. 1208	Cambridge University founded.
1209	King John of England excommunicated by Pope Innocent III.
1212	Children's Crusade.
1213	King John of England submitted to the Pope.
1214	Jenghiz Khan captured Peking.
c. 1214	Birth of Roger Bacon, friar and thinker.
1215	Magna Carta sealed by King John.
1226	Death of St. Francis of Assisi, founder of the Franciscan Order (Grey Friars).
1241	Mongol invasion of Europe.
1248	Seventh Crusade.
1248	Seville taken from the Moors by Ferdinand III of Castile.
1258	Baghdad sacked by the Mongols.
1265	De Montfort's Parliament.
1274	Death of St. Thomas Aquinas.
1282	The Sicilian Vespers: massacre of the Normans in Sicily.
1284	Birth of the first Prince of Wales at Caernarvon Castle.
1290	Jews expelled from England.
1291	Swiss Confederation founded.
1292	Kublai Khan, founder of the Yuan dynasty in China, died.
1295	The "Model Parliament" called by Edward I.
1296	Scotland invaded by Edward I.
1298	Battle of Falkirk: Scots defeated by the English.

A.D.	
1307	Switzerland declared itself independent.
1314	Battle of Bannockburn: Edward II defeated by Bruce.
1321	Dante, Italian poet, died.
c. 1325	Tenochtitlan (Mexico City) founded by the Aztecs.
1327	Edward II murdered at Berkeley Castle.
1331	Flemish weavers settled in England.
1337	Beginning of the Hundred Years' War.
1340	Chaucer born.
1340	Battle of Sluys. English naval victory over the French.
1346	Battle of Crécy.
1347	Calais captured by Edward III of England.
1348–1349	Black Death.
1353	Ottoman Turks entered Europe.
1356	Battle of Poitiers: defeat of the French by the Black Prince.
1360	Turks captured Adrianople.
1368	Ming Dynasty in China founded.
1374	Petrarch, Italian poet, died.
1378	Great Schism in the Western Church.
1381	Peasants' Revolt in England.
1382	First English Bible, a translation from the Latin Vulgate.
1384	John Wyclif, religious reformer, died.
1389	Battle of Kossovo: defeat of the Serbians by the Turks.
1397	Denmark, Norway and Sweden united.
1398	Tamerlane invaded India.
1415	John Huss burned at Prague for heresy.
1415	Battle of Agincourt: victory of Henry V of England over the French.
1429	Joan of Arc relieved Orleans.
1431	Joan of Arc burned at Rouen (canonized 1920).
1441	Eton College founded by Henry VI.
c. 1450	Printing by movable type invented at Mainz.
1453	Turks captured Constantinople and founded the Ottoman Empire.
1455	Wars of the Roses commenced; first Battle of St. Albans.
1460	Battle of Northampton: Lancastrians routed by the Yorkists.
1469	Lorenzo de' Medici, the Magnificent, became ruler of Florence.
1476	Printing introduced into England by Caxton.
1485	Wars of the Roses ended by Battle of Bosworth: Henry VII (Lancaster) defeated Richard III (York).
1486	Bartholomew Diaz discovered the Cape of Good Hope.
1492	Columbus discovered West Indies.
1492	Expulsion of Moors from Spain.
1497	Discovery of Newfoundland by John Cabot.
1498	Vasco da Gama reached India from Portugal by the Cape of Good Hope route.
1498	Mainland of South America discovered by Columbus.
1500	Brazil discovered by Pinzon, a Spaniard.
1511	War between England and France.
1513	Scots defeated at Battle of Flodden Field.
1513	Pacific Ocean discovered by Balboa.
1516	Publication of Sir Thomas More's *Utopia*.
1519	Charles V elected Holy Roman Emperor.
1519–1521	Mexico conquered by Cortez.
1520	Ferdinand Magellan, Portuguese, reached the Pacific Ocean via the Straits of Magellan.
1520	Luther burnt the Pope's Bull, or proclamation, at Wittenberg.
1527	Sack of Rome by de Bourbon.
1529	Turks defeated before Vienna.
1530	Fall of Cardinal Wolsey from power.
1530	Conquest of Peru begun by Francisco Pizarro.
1531	Ulrich Zwingli, Swiss religious reformer, killed in the Battle of Cappel.
1534	Canada discovered by Jacques Cartier.
1535	English Bible, translated by Coverdale and Tyndale, published.
1535	Sir Thomas More beheaded.
1535	Lima, capital of Peru, founded by Pizarro.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.D.

1536 Erasmus, Dutch author and scholar, died.
1536–1540 Dissolution of the English monasteries.
1540 The Society of Jesus (Jesuit Order) founded by Ignatius de Loyola.
1545 Massacre of the Waldenses.
1546 Martin Luther died at Eisleben.
1549 Francis Xavier, great Jesuit missionary, began his work in Japan.
1556 Archbishop Cranmer burned at the stake.
1558 Loss of Calais, England's last possession in France.
1563 Potato introduced to England from South America by John Hawkins.
1564 Shakespeare born.
1565 Drake made his first voyage to the West Indies.
1566 Royal Exchange founded.
1567 Revolt of the Netherlands against Spain.
1571 Battle of Lepanto: Venice, Spain and the Papal States defeated the Turks.
1572 St. Bartholomew's Day massacre in France.
1577–1580 Sir Francis Drake sailed round the world.
1579 India first reached by an Englishman, Thomas Stephens.
1580 Portugal seized by Philip II of Spain.
1582 Change made in the Calendar by Pope Gregory XIII.
1586 Battle of Zutphen: Sir Philip Sidney killed.
1587 Mary Queen of Scots executed.
1588 Attempted invasion of England by the Spanish Armada.
1594 Mercator, mathematician and geographer, died.
1598 Edict of Nantes, giving French Huguenots equal political rights with Catholics.
1600 East India Company chartered.
1603 Union of Crowns of England and Scotland.
1605 Gunpowder Plot.
1607 Foundation of Jamestown, Virginia, first permanent English settlement in America.
1608 Quebec founded by Samuel de Champlain.
1608 John Milton born.
1610 Hudson Bay discovered by Henry Hudson.
1610 Assassination of Henri IV of France.
1610 Largest warship yet built in England, the *Prince Royal* (1,400 tons), launched at Woolwich.
1611 Authorized Version of the Bible published.
1611 Bombay ceded to England by Portugal as part of the dowry of the consort of Charles II.
1611 Plantation of Ulster.
1613 English factories established at Surat, in India.
1616 Death of Shakespeare.
1616 Manchus invaded China.
1616 William Harvey discovered the circulation of the blood.
1618–1648 Thirty Years' War.
1620 The Pilgrim Fathers set sail.
1621 Dutch West India Company chartered.
1624 Richelieu became chief Minister of France.
1625 Publication of *Of the Law of War and Peace*, by Hugo Grotius, Dutch jurist.
1626 St. Peter's, Rome, consecrated.
1632 Galileo summoned before the Inquisition.
1632 Gustavus Adolphus of Sweden killed at Battle of Lützen.
1635 French Academy founded by Richelieu.
1642 Cardinal Richelieu died.
1642 New Zealand and Tasmania discovered by Abel Tasman.
1642–1649 Civil War in England.
1644 Establishment of the Manchu dynasty in China.
1645 Archbishop Laud beheaded.
1649 Charles I executed; sack of Drogheda by Cromwell.
1652 Cape Town founded by the Dutch East India Company.

A.D.

1652–1664 First Dutch War.
1653 Oliver Cromwell became Lord Protector.
1655 Capture of Jamaica.
1660 Restoration of Charles II.
1660 Royal Society founded.
1661 The Bank of Sweden issued the first bank note.
1664 New Amsterdam taken by the English from the Dutch and renamed New York.
1664 French East India Company granted a charter.
1665 Great Plague of London.
1665–1667 Second Dutch War.
1666 Great Fire of London.
1667 Dutch fleet under De Ruyter in the Medway.
1670 Hudson's Bay Company chartered.
1672–1674 Third Dutch War.
1675 St. Paul's Cathedral begun.
1678 Bunyan's *Pilgrim's Progress* published.
1670 Habeas Corpus Act.
1682 Accession of Peter the Great of Russia.
1682 Pennsylvania founded.
1683 Turks defeated before Vienna by John Sobieski of Poland.
1685 Revocation of the Edict of Nantes.
1685 Bach and Handel born.
1688 William of Orange became King of England.
1689 Bill of Rights.
1694 Voltaire born.
1694 Bank of England founded.
1694 Beginning of the National Debt.
1698 First Eddystone Lighthouse built.
1703 John Wesley born.
1704 Battle of Blenheim: Marlborough defeated the French.
1704 Gibraltar captured by Rooke.
1707 Carl von Linnaeus, Swedish botanist, born.
1707 Union of England and Scotland.
1709 Pianoforte invented by Cristofori.
1714 Finland annexed by Peter the Great.
1715 Jacobite rising in England and Scotland.
1720 The South Sea Bubble.
1724 Immanuel Kant, German philosopher, born.
1727 *Beggar's Opera* first produced.
1733 Flying shuttle invented by Kay.
1739 Persian invasion of India under Nadir Shah.
1739 Wesley and Whitefield begin the Methodist revival.
1740–1744 Anson sailed round the world.
1740–1748 War of the Austrian Succession.
1741 Frederick the Great occupied Silesia.
1745 Jacobite rising.
1746 Battle of Culloden.
1749 Goethe born at Frankfort-on-the-Main.
1756–1763 Seven Years' War: Great Britain and Prussia defeated Austria, Russia and France.
1756 The "Black Hole of Calcutta" tragedy.
1757 Establishment of British supremacy in Bengal.
1759 British Museum opened at Montague House.
1759 Capture of Quebec by Wolfe.
1759 Robert Burns born.
1761 Bridgewater Canal, the first in England, opened.
1762 Catherine II became Empress of Russia.
1762 Rousseau's *Contrat Social* published.
1763 France ceded Canada to England.
1764 Spinning jenny invented by Hargreaves.
1764 Watt completed his steam engine.
1770 Beethoven born.
1772 First partition of Poland.
1774 Oxygen identified by Joseph Priestley.
1775 Outbreak of the War of American Independence.
1776 Adam Smith's *Wealth of Nations* published.
1783 First ascent of a balloon with human passengers.
1783 Independence of the United States.
1784 Steam hammer patented by James Watt.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.D.	
1788	Botany Bay, Australia, occupied by Great Britain as a penal settlement.
1789	George Washington became first President of the United States of America.
1789	Outbreak of the French Revolution.
1791	Metric system adopted by the French National Assembly.
1792	Denmark abolished the slave trade.
1793	Execution of Louis XVI of France and Marie Antoinette.
1793	Second partition of Poland.
1793	The cotton gin invented by Eli Whitney.
1794	Battle of the Glorious First of June: victory of Howe over the French.
1795	Third partition of Poland.
1797	Mutinies at Portsmouth and the Nore.
1797	The last Doge of Venice abdicated.
1798	Battle of the Nile: destruction of the French fleet by Nelson.
1798	Napoleon Bonaparte became First Consul.
1800	Malta captured by the British.
1800	Union of England and Ireland.
1801	Invention of electric arc lamp by Davy.
1802	First English Factory Act.
1802	Peace of Amiens between Great Britain and France.
1803	Louisiana sold to the United States by France.
1804	Construction of the Caledonian Canal, Scotland, begun by Thomas Telford.
1804	Napoleon Bonaparte became Emperor of the French as Napoleon I.
1805	Battle of Austerlitz.
1805	Battle of Trafalgar: defeat of French and Spanish fleets, and death of Nelson.
1805	Schiller, German poet, died.
1806	Battle of Jena: defeat of Prussia by France.
1806	Cape Town captured by the British.
1806	Title of Holy Roman Emperor abolished.
1806	William Pitt died.
1807	Fulton's steamboat *Clermont* made a trial trip of 160 miles.
1807	Pall Mall, London, lighted by gas.
1809	Charles Darwin, naturalist, born.
1809	French expelled from Portugal by Wellesley.
1811	Franz Liszt, Hungarian composer and pianist, born.
1811	Krupp works at Essen, Germany, founded.
1812	Charles Dickens, author, born.
1812	Invasion of Russia by Napoleon I.
1812–1814	War between Great Britain and the United States.
1813	Battle of Leipzig: Napoleon I defeated by the Allies.
1814	Louis XVIII King of the French.
1814	Simon Bolivar became President of Venezuela.
1814	Union between Denmark and Norway severed.
1815	Battle of Waterloo: overthrow of Napoleon I.
1815	Belgium and Holland united.
1815	Holy Alliance formed by Russia, Austria and Prussia.
1815	Prince Bismarck, German statesman, born.
1816	First savings bank established in London.
1817	Kaleidoscope invented by Sir David Brewster.
1819	Queen Victoria born.
1819	Singapore founded by the British.
1819	Telford's suspension bridge across the Menai Strait begun.
1819	The Floridas bought from Spain by the United States.
1821	Death of Napoleon I at St. Helena.
1822	Caledonian Canal opened.
1822	Liberia established by the American Colonization Society.
1822	Louis Pasteur, French chemist, born.
1823	The *Monkey* (212 tons) purchased for the British Navy. It was the first steam vessel in the service.
1824	Lord Byron died while serving in the War of Greek Independence.
1824	Lord Kelvin, scientist and inventor, born.
1825	Polar expedition of Sir John Franklin.

A.D.	
1825	Stockton and Darlington Railway, the first to carry passengers, opened.
1827	Battle of Navarino: British, French and Russian fleets defeated Turkey.
1827	Beethoven died.
1828	Henrik Ibsen, Norwegian poet and dramatist, born.
1829	Catholic Emancipation Act.
1829	First University Boat Race.
1829	George Stephenson won £500 with the *Rocket* locomotive.
1830	Accession of Louis Philippe of France.
1830	Liverpool and Manchester Railway opened.
1831	Discovery of the North Magnetic Pole by Capt. John Ross.
1831	Invasion of Poland by Russia.
1832	Death of Sir Walter Scott.
1832	Goethe died.
1832	Passing of the Reform Bill.
1832	Poland annexed by Russia.
1833	Factory Act.
1833	Greece liberated from Turkey.
1833	Slavery abolished by Great Britain.
1834	Houses of Parliament burned.
1835	Froebel established the first kindergarten school.
1836	London University founded.
1836	Transvaal and Orange Free State founded by the Boers.
1837	Accession of Queen Victoria.
1837	Electric telegraph invented by Samuel Morse.
1837	Rebellion in Upper Canada.
1838	Ericsson patented his screw-propeller.
1839	Britain took possession of Aden.
1839–1841	First Afghan War.
1840–1842	Opium War between China and Great Britain.
1840	Penny Post established in England.
1840	Queen Victoria married Prince Albert of Saxe-Coburg.
1840	Thomas Hardy, novelist and poet, born.
1841	*Punch* first published.
1841	Self-government granted to Canada.
1842	Algiers annexed to France.
1842	First Coal Mine Act.
1842	Hongkong ceded to Great Britain.
1843	First International Peace Congress held in London.
1843	Natal annexed by the British.
1844	First message sent by electric telegraph.
1844	Fleet Prison, London, closed.
1845	First Sikh War.
1846	Free Trade adopted by Great Britain.
1846–1848	Mexican War.
1846	Repeal of the Corn Laws.
1847	Negro republic of Liberia founded.
1848	Discovery of gold in California, U.S.A.
1848	Revolutionary movement in Europe.
1848	Chartists presented monster petition to Parliament.
1848	Second Sikh War.
1849	Annexation of the Punjab by Great Britain.
1850	Britannia Bridge over the Menai Straits opened.
1850	William Wordsworth, poet, died.
1851	Gold discovered in Victoria, Australia.
1851	Great Exhibition in Hyde Park, London.
1852	Louis Napoleon became Emperor of the French.
1854	Crimean War between Russia and the allied forces of Great Britain, France, Turkey and Sardinia: battles of Alma, Balaclava and Inkerman, and siege of Sebastopol.
1854	Japan forced to open certain of her ports to United States ships.
1855	Bessemer process of making steel patented by Henry Bessemer.
1855	Bridge across Niagara Falls completed.
1855	Victoria Falls, on the Zambezi River, Northern Rhodesia, discovered by Dr. David Livingstone.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.D.

1856 Crimean War ended by the signing of the Peace of Paris.
1856 Victoria Cross instituted.
1857 Indian Mutiny.
1858 Gold discovered in British Columbia.
1858 J. H. Speke discovered Victoria Nyanza.
1859 Beginning of the Volunteer movement.
1859 Darwin's *Origin of Species* published.
1859 Launch of the *Great Eastern* (25,000 tons).
1860 Earthquake in Tokyo, Japan, with loss of 200,000 lives.
1860 Etienne Lenoir made first practicable gas engine.
1860 Insurrection of Maoris in New Zealand.
1860 Launch of the *Warrior* (9,210 tons), first British sea-going ironclad.
1860 Tientsin, China, became a treaty port.
1861 Post Office Savings Bank opened.
1861–1865 American Civil War.
1861 Cotton famine in Lancashire.
1861 Serfdom abolished in Russia.
1862 Bismarck became chief Minister of Prussia.
1862 Fight between the *Monitor* and *Merrimac*, the first between ironclads.
1862 Slavery abolished in the United States.
1864 International Red Cross founded.
1864 Prussia and Austria attacked Denmark.
1865 End of American Civil War. Assassination of President Lincoln.
1866 Battle of Sadowa: Prussian victory over the Austrians.
1866 Dynamite invented by Alfred Nobel.
1866 First Atlantic cable successfully laid.
1866 Schleswig and Holstein annexed by Prussia.
1867 Alaska purchased by the United States from Russia.
1867 Diamonds first discovered in South Africa.
1867 Federation of Canada.
1867 Institution of the Dual Monarchy of Austria and Hungary by Francis Joseph I.
1868 Benjamin Disraeli became Prime Minister of Great Britain for the first time.
1868–1874 Gladstone's first Ministry.
1869 Suez Canal opened.
1870 Establishment of the Board Schools in England.
1870–1871 Franco-Prussian War: France defeated.
1870 Mont Cenis tunnel through the Alps completed.
1870 Telegraphs taken over by the State in Great Britain.
1871 Adoption of the ballot in Great Britain.
1871 Bank Holidays Act passed.
1871 Disestablishment of the Church of England in Ireland.
1871 Religious tests abolished at the universities of Oxford and Cambridge.
1871 Rescue of Dr. Livingstone by H. M. Stanley.
1871 Royal Albert Hall, Kensington, opened.
1872 Building trades strike in London.
1872 First railway in Japan opened.
1872 Mazzini, Italian patriot, died.
1874 Fiji Islands annexed by Great Britain.
1874 International Postal Union formed at Berne, Switzerland.
1874 Rt. Hon. Winston Churchill born.
1876 Proclamation of Queen Victoria as Empress of India.
1876 Telephone invented by Alexander Graham Bell.
1877 Russo-Turkish War.
1877 Transvaal Republic first annexed to the British Empire.
1878 Congress of Berlin.
1878 London University decided to grant degrees to women.
1878 Rumania became independent.
1878–1880 Second Afghan War.
1879 First Church of Christ, Scientist, founded by Mrs. Mary Baker Eddy.

A.D.

1879 Zulu War.
1880 General Roberts occupied Kandahar.
1880 Royal Albert Docks opened.
1880 Tahiti annexed by France.
1880 St. Gotthard Tunnel completed.
1881 Battle of Majuba Hill: defeat of the British by the Boers.
1881 Czar Alexander II assassinated.
1881 Independence of the Transvaal, subject to British suzerainty, recognized by Great Britain.
1881 Revised version of the New Testament published.
1881 The French under Ferdinand de Lesseps began the Panama Canal.
1882 Bombardment of Alexandria.
1882 Giuseppe Garibaldi, Italian patriot, died.
1882 First co-operative dairy in Denmark founded.
1882 First electric tramway opened in England.
1882 Phœnix Park murders.
1882 Serbia proclaimed a kingdom.
1882 Society for Psychical Research founded.
1882 Tuberculosis germ discovered by Dr. Koch.
1883 Egypt occupied by Great Britain.
1883 Electric tramcars began to run in London.
1883 Karl Marx, founder of modern socialism, died.
1883 Parcel post inaugurated.
1884 Compound steam turbine invented by the Hon. (later Sir) C. A. Parsons.
1885 Canadian Pacific Railway completed.
1885 Gordon killed at Khartum.
1885 Leopold I, King of the Belgians, proclaimed King of the Congo State.
1885 Revised Version of the Old Testament published.
1885 The Mersey Tunnel opened.
1885 Victor Hugo, French novelist and poet, died.
1886 Discovery of gold in the Witwatersrand, South Africa.
1886 Incandescent gas mantle invented by C. A. von Welsbach, of Vienna.
1886 Johannesburg founded.
1887 First British Colonial Conference held.
1887 First Daimler motor-car built.
1887 Jubilee of Queen Victoria.
1888 Greenland crossed by Fridtjof Nansen, Norwegian.
1889 Brazil became a republic.
1889 Coal strike in Germany.
1889 Eiffel Tower, Paris, inaugurated.
1889 Nicaragua Canal begun.
1890 Beginning of constitutional government in Japan.
1890 Bismarck dismissed by the Emperor William II.
1890 Cecil Rhodes became Prime Minister of Cape Colony.
1890 Forth Bridge opened.
1890 Heligoland ceded to Germany by Great Britain.
1891 Education Act: free instruction in public elementary schools.
1891 Section of the Trans-Siberian Railway opened.
1891 Strike of mill operatives in England.
1894 Louis Kossuth, Hungarian patriot, died.
1894 Manchester Ship Canal opened.
1894 Timbuktu occupied by French troops.
1894 War between Japan and China.
1895 Chitral Expedition.
1895 Prince Albert (later King George VI) born.
1895–1896 Jameson Raid into the Transvaal.
1895 Japanese captured Wei-hai-wei.
1895 Kiel Canal opened.
1895 X-rays discovered by Wilhelm Konrad Röntgen.
1896 Electrons identified by Sir J. J. Thomson.
1896 Madagascar conquered by the French.
1896 Olympic Games revived.
1897 Diamond Jubilee of Queen Victoria.
1897 Sir Isaac Pitman, inventor of phonography, died.
1897 Wireless demonstrated by Guglielmo Marconi.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.D.	
1898	Battle of Omdurman; Khartum re-taken.
1898	Discovery of radium.
1898	Spanish-American War: victory of the U.S.
1899	Beginning of South African (Boer) War.
1899	Establishment of the Permanent Court of Arbitration at The Hague.
1899	Nigeria annexed by Great Britain.
1900	Australian Commonwealth proclaimed.
1900	Boxer insurrection in China.
1900	Queen Elizabeth born.
1900	South African War; Orange Free State and Transvaal annexed by Great Britain.
1901	Commonwealth of Australia established.
1901	Death of Queen Victoria.
1901	Santos Dumont circled the Eiffel Tower in an airship.
1901	Nobel Prizes first awarded.
1901	Theodore Roosevelt President of U.S.
1901	Thames Embankment lighted by electricity.
1901	Wireless message sent across the Atlantic.
1902	Coronation of King Edward VII.
1902	Death of Cecil Rhodes.
1902	End of the South African (Boer) War by peace signed at Pretoria.
1902	Settlement of boundary dispute between Chile and Argentine.
1903	Orville Wright made first aeroplane flight.
1903	Republic of Panama founded.
1904	Entente Cordiale with France.
1904	Inauguration of Empire Day.
1904-1905	Russo-Japanese War: victory of Japan.
1904	The U.S. commenced new Panama Canal; engineer-in-chief, Gen. G. W. Goethals.
1905	Norway and Sweden separated.
1905	Simplon Tunnel completed.
1905	Trans-Siberian Railway completed.
1906	First Russian Duma met.
1906	Great earthquake at San Francisco, U.S.A.
1906	H.M.S. *Dreadnought*, all-big-gun ship, commissioned.
1907	Dr. Maria Montessori introduced her system of education in Rome.
1907	New Zealand became a Dominion.
1907	Peace Conference at The Hague.
1907	Territorial Army of Great Britain created.
1908	Boy Scout movement founded by Sir Robert (later Lord) Baden-Powell.
1908	Congo territory became a Belgian colony.
1908	Earthquake in Sicily and Calabria, Italy: 76,000 people killed.
1908	Finnish Diet dissolved by the Russian Government.
1908	Old-Age Pensions Act.
1909	Abdul Hamid, Sultan of Turkey, deposed.
1909	Louis Blériot made first crossing of the English Channel by air.
1909	Labour Exchanges opened.
1909	North Pole reached by Peary.
1910	King Edward VII died.
1910	Count Tolstoy, Russian reformer and author, died.
1910	Florence Nightingale died.
1910	Flight of the *Deutschland*, the first passenger airship.
1910	Korea annexed by Japan.
1910	Portugal became a republic.
1910	Union of South Africa established.
1911	China proclaimed a republic.
1911	Delhi became capital of India in place of Calcutta.
1911	National Insurance Act.
1911	South Pole reached by Roald Amundsen.
1912	Loss of the *Titanic*: 1,513 passengers and crew drowned, 711 saved.
1912	Morocco became a French protectorate.
1912	Suffragette agitation in England.
1912	Robert Falcon Scott died on returning from the South Pole, which had been reached by Roald Amundsen a month earlier.
1913	Balkan War.
1914	Panama Canal opened.
1914	Assassination of Archduke Charles of Austria at Sarajevo precipitates First World War.
1914	Battles of Mons, Marne, Aisne, Ypres, Tannenberg.
1916	Battles of Jutland (naval) and Somme.
1916	British Compulsory Service Act came into force.
1916	Irish rebellion in Dublin
1916	David Lloyd George became Prime Minister of Great Britain.
1917	Battles of Verdun and Passchendaele.
1917	Italian defeat at Caporetto.
1917	Battle of Cambrai: tanks first used.
1917	Jerusalem occupied by the British.
1917	Retreat of the Germans to the Hindenburg Line.
1917	Revolution in Russia.
1917	The Danish West Indies (Virgin Islands) transferred to the United States.
1917	United States declared war on Germany.
1918	Raids on England by German aeroplanes.
1918	Armistice signed (November 11).
1918	Women granted the franchise in Great Britain.
1919	Danzig became a Free City under the League of Nations.
1919	First crossing of the Atlantic by airship, the British R34.
1919	John Alcock and Arthur Whitten Brown made first direct crossing of the Atlantic by aeroplane.
1919	Lady Astor became the first woman to sit as a member of the British Parliament.
1919	Treaty of Versailles (June 28).
1920	Lambeth Conference Appeal for the Reunion of Christendom.
1920	League of Nations established.
1920	The Permanent Court of International Justice established by the League of Nations.
1921	Belfast became the capital of Northern Ireland.
1921	Germany's indemnity to the Allies of the First World War was fixed at the huge amount of £6,600,000,000.
1922	Irish Free State inaugurated.
1922	The Fascisti marched on Rome; Benito Mussolini became Prime Minister of Italy.
1923	Duke of York (later King George VI) married Lady Elizabeth Bowes-Lyon.
1923	Earthquake in Tokyo.
1923	Mustapha Kemal became President of the Republic of Turkey.
1924	British Empire Exhibition at Wembley.
1924	First Labour Government in Great Britain.
1924	Nikolai Lenin, Bolshevist leader, died.
1925	Field Marshal Paul von Hindenburg elected President of the German Republic.
1925	Locarno Conference.
1926	General Strike in Great Britain.
1926	North Pole reached by Amundsen in the airship *Norge*.
1926	Princess Elizabeth born.
1927	*The Jazz Singer*, first full-length talking film, shown.
1927	Australian Parliament House at Canberra opened by King George VI (then Duke of York).
1928	Kellogg Peace Pact, "to renounce war as an instrument of national policy," signed in Paris by many Powers.
1928	Nanking made the capital of China by the Nationalists.
1928	Hinkler made the first solo flight from England to Australia in 15 days 2 hours.
1929	Discovery of skull of the Peking Man (*Sinanthropus pekinensis*).
1929	Margaret Bondfield became the first woman to hold Cabinet rank.
1929	The *Graf Zeppelin* airship flew round the world.
1930	Montreal suspension bridge across St. Lawrence River opened.
1931	Alfonso XIII of Spain abdicated.
1931	Flight Lieut. G. H. Stainforth flew in a seaplane at 415·2 miles an hour.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.D.

1931 Great Britain suspended the Gold Standard.
1931 Spanish Republic proclaimed.
1931 Sydney Harbour bridge opened.
1932 Disarmament Conference at Geneva.
1932 Goldfield discovered in Kenya.
1932 Imperial Economic Conference at Ottawa.
1932 Manchuria became the independent state of Manchukuo.
1932 Eamon de Valera became President of the Irish Free State (Eire).
1932 South Africa abandoned the Gold Standard.
1933 French liner *l'Atlantique* (42,512 tons) burned at sea.
1933 World Economic Conference met in London.
1933 Adolf Hitler became German Chancellor.
1933 Franklin Delano Roosevelt became President of the United States.
1933 World's largest dry dock opened at Southampton.
1934 The *Queen Mary* (80,773 tons) launched.
1934 Death of Field Marshal von Hindenburg; Adolf Hitler became President.
1934 Dr. Engelbert Dollfuss, Austrian Chancellor, assassinated.
1934 Opening of the Mersey Tunnel.
1934 King Alexander of Yugoslavia assassinated.
1935 Silver Jubilee of King George V.
1935 Return of the Saar to Germany.
1935 War between Italy and Abyssinia (Ethiopia).
1935 Burma separated from India.
1935 Conscription re-adopted in Germany.
1936 Abyssinia annexed by Italy.
1936 Anti-Comintern Pact concluded between Germany and Japan.
1936 Outbreak of Civil War in Spain.
1936 F. D. Roosevelt re-elected President of the United States.
1936 "Popular Front" Government formed in France by Léon Blum.
1936 Re-occupation of the Rhineland by Germany.
1936 Treaty of London between Great Britain, the U.S.A. and France for the limitation of naval armaments.
1936 Death of King George V (Jan. 20).
1936 Abdication of King Edward VIII (Dec. 11).
1937 Coronation of King George VI (May 12).
1937 Italy signed the Anti-Comintern Pact.
1937 Japanese attacked China on large scale.
1937 Partition of Palestine scheme rejected by Arabs and Jews.
1938 Annexation of Austria by Germany.
1938 Munich Agreement; Chamberlain's interviews with Hitler (Sept.).
1939 Czechoslovakia occupied by Germany (March).
1939 Albania occupied by Italy.
1939 Russo-German Pact of non-aggression.
1939 Germany invaded Poland, beginning the Second World War (Sept. 1).
1939 Great Britain and France at war with Germany (Sept. 3).
1939 Russia invaded Poland.
1939 Russia invaded Finland.
1940 Winston Churchill succeeded Neville Chamberlain as Prime Minister.
1940 Estonia, Latvia and Lithuania annexed by the U.S.S.R.
1940 Denmark, Norway, Holland, Belgium and Luxemburg invaded and occupied by Germany.
1940 Germans broke through at Sedan (May 15); British evacuated from Dunkirk (June); France signed armistice with Germany (June 22) and with Italy (June 24).
1940 Air Battle of Britain (Aug. 8–Oct. 31).
1941 British evacuated Greece and Crete.
1941 Germany invaded Russia (June 22).
1941 Japan attacked Pearl Harbour; U.S.A. entered the war (Dec. 7).
1941 The battleships *Prince of Wales* and *Repulse* sunk by Japanese air attack.
1942 American and British forces under Eisenhower landed in Algeria and French Morocco. Battle of El Alamein.

A.D.

1942 Japanese captured Malaya, the Philippines, Burma, Dutch East Indies, etc.
1942 Battle of Stalingrad.
1942 Naval battles of the Coral Sea and Midway.
1943 Axis forces in N. Africa surrendered.
1943 Sicily and Italy invaded by the Allies.
1943 Enforced resignation of Mussolini; Italian armistice; Italy declared war on Germany; Fascist Party dissolved.
1943 British offensive in Burma.
1944 Allies landed in France (D-Day, June 6).
1944 Dumbarton Oaks (U.S.A.) Conference on maintenance of peace and security.
1944 New Education Act.
1944 Armistice granted to Rumania and Bulgaria.
1944 Roosevelt elected President of the U.S.A. for the fourth time.
1944 Civil War in Athens.
1944 Iceland voted a republic.
1945 President Roosevelt, aged sixty-three, died (April 12). Truman, Vice-President, succeeded.
1945 Russian and American Armies met in Germany (April 26).
1945 Berlin surrendered to Russians (May 2).
1945 German forces in Italy capitulated (May 2)
1945 Unconditional surrender of Germany (May 7).
1945 Atomic bombs dropped on Hiroshima (Aug. 6. and Nagasaki (Aug. 9).
1945 Unconditional surrender of Japan (Aug. 14).
1945 San Francisco Conference (April 25–June 26).
1945 Resignation of the Coalition Government (May 23).
1945 Labour Government formed.
1945 Potsdam Conference of Britain, the United States and Russia.
1946 The Philippines proclaimed an independent republic.
1946 India Interim Government appointed.
1946 Bread rationed in the United Kingdom.
1946 Greece declared a monarchy. Return of King George of the Hellenes to Athens.
1946 Trial of Nazi leaders at Nuremberg.
1946 U.S.A. Radar reported first man-made contact with the moon.
1946 League of Nations dissolved.
1946 First meeting of United Nations Assembly in New York.
1947 Coal mines in U.K. nationalized.
1947 British forces withdrawn from Egypt.
1947 Breakdown of London Four-power Conference on Reparations.
1947 First pilotless plane, guided by "mechanical brain," crossed Atlantic, carrying fourteen observers.
1947 Marriage of Princess Elizabeth and Lieut. Philip Mountbatten (created Duke of Edinburgh).
1948 Assassination of Mahatma Gandhi in India.
1948 Communists seized power in Czecho-Slovakia.
1948 Britain surrendered mandate in Palestine. State of Israel proclaimed.
1948 Abdication of Queen Wilhelmina of Netherlands.
1948 Latin-American claims to British territories in S. America and Antarctica.
1948 Nationalization of transport, electricity and gas in U.K.
1948 United Europe Movement launched at the Hague.
1948 Western Union (Anglo-French-Benelux) 50-year treaty signed.
1948 Electoral defeat of United Party in S. Africa.
1948 National Health and National Insurance schemes launched.
1948 Berlin crisis. Soviets cut land communications to American, British and French sectors. Air-lift introduced.
1948 Olympic Games in London.
1948 Imperial Conference in London.
1948 Harry S. Truman elected President of United States.
1948 Birth of Prince Charles, son of the Duke and Duchess of Edinburgh.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE NEW HOUSEHOLD PHYSICIAN

Authoritative Advice on the Care of the Body in Health and its Treatment in Sickness

ABDOMEN.—The lower part of the trunk between the diaphragm and the brim of the pelvis. Above it is the thorax, containing the lungs and heart and protected by the ribs, and below it is the pelvis, containing the urinary bladder and the reproductive organs. The abdomen is protected by the lower ribs and contains within its cavity the stomach and intestines, liver and gall-bladder, pancreas and spleen; the kidneys lie behind the abdominal cavity. The abdomen may be the seat of several important diseases, such as appendicitis, inflammation of the gall-bladder, peritonitis, of which pain is usually the first and most marked symptom. Abdominal pain, if not due merely to some indiscretion of diet, requires a doctor to recognize its cause, and not even a dose of castor oil should be given until the doctor has given his opinion.

ABORTION.—The expulsion from the womb of the products of conception, up to the sixth month of pregnancy; after that period the term premature birth is generally used. Abortions are most common during the first three months of pregnancy and may be due to poor health, to various acute or chronic diseases, or to disease or displacement of the womb. As is well known, abortion may be due to a criminal act, the taking of a poisonous drug or the use of an instrument, and may result in the death of the patient. No drug is certain to bring about an abortion except in such quantity that it endangers the life of the woman who takes it. A woman who has a threatened abortion or miscarriage should go to bed at once and, if the bleeding does not stop in a short time, should send for a doctor, as the condition may be serious.

ABSCESS.—An abscess is an accumulation of pus which usually causes a distinct swelling, accompanied by a throbbing pain. The centre of the infected area has a yellow appearance, and the surrounding skin is red and hard. The abscess may break of its own accord and the pus drain away satisfactorily, but it is more advisable to have it opened by a doctor when the suppuration has reached the proper stage.

Treatment.—Fomentations of boric acid or Epsom salts may be applied, as hot as the patient can stand, in order to bring the abscess to a head as quickly as possible. Applications of kaolin plaster are also very good. After the abscess has been opened, or has ruptured, great care should be taken to keep the wound as clean as possible. A dressing of lint, wrung out in warm boric acid and covered with a piece of oil-silk, is a very easy and safe treatment, or fomentations of the same lotion should be applied as often as possible. Plenty of nourishing food and rest and fresh air should be taken, as abscesses are usually a sign that the general health needs attention.

ACETIC ACID POISONING.—This is diagnosed from the strong smell of vinegar present in the breath. The mouth and lips are usually stained and burned.

Treatment.—Give a warm drink of soap and water or chalk and water; the plaster from the walls or ceiling may be used. Follow this up with oil, milk or gruel; but on no account should an emetic be given.

ACHILLES TENDON.—The tendon attached to the back of the heel.

ACHILLOBURSITIS. — Inflammation of the bursæ adjacent to Achilles tendon.

ACHYLIA.—Absence of chyle or gastric juice.

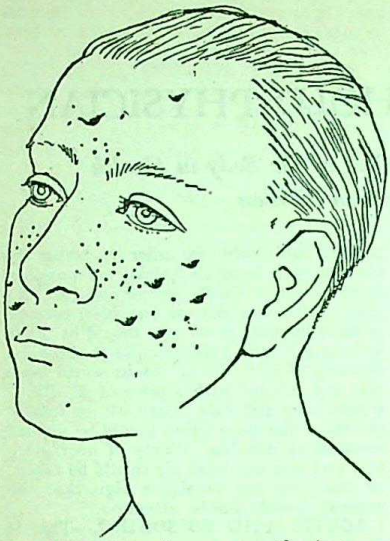
ACIDOSIS.—Acid intoxication, due to overproduction or faulty elimination of acid in the body.

ACNE.—Commonly called "blackheads." An eruption of comedones or pimples with black heads, found most frequently in young people of both sexes. They are most commonly situated on the face and shoulders, and the skin is always greasy and flabby. There is usually dandruff or seborrhœa of the scalp as well. To treat the condition the general health should be attended to, plenty of exercise in the fresh air taken, and all rich foods should be avoided. The face should be steamed each day and the blackheads squeezed out, while a sulphur soap may be well rubbed in at night if the skin will tolerate it. Early vaccine treatment is most beneficial.

ACNE ROSACEA.—This condition is often known as Rosacea alone, and begins with a flushing of the face, which tends to become chronic, the skin of the middle of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Appearance of acne upon the face

the face becoming permanently red and thickened. The condition is caused mostly through digestive disturbances in patients whose circulation is poor. In women an important factor is functional or organic uterine disorder. The worst cases are usually those of chronic spirit drinkers. Everything in the way of food and drink which is known to flush the face should be avoided, and local treatment as in acne may be tried. If the condition persists, more drastic treatment such as cauterization, electrolysis, X-rays or radium may be tried.

ACONITE POISONING.—Aconite is a drug obtained from the plant known by the various names of monkshood, wolfsbane and blue rocket; it is sometimes mistaken for horseradish. In cases of poisoning an emetic should be given, either mustard and water or zinc sulphate, followed by a stimulant such as strong tea or spirits.

ACROMEGALY.—This disease is caused by over-activity of the pituitary gland situated at the base of the brain. The body assumes an abnormal size and headaches and general weakness are complained of. Some benefit may be had from pituitary extract.

ACTINOMYCOSIS.—This disease results from infection by the fungus known as actinomyces or ray fungus. It is not common in man, but occurs frequently in cattle and horses. Surgical measures are often necessary to drain the tumours which appear. Vaccines have given good results.

ADDISON'S DISEASE.—The cause of this affection is the diseased state of the suprarenal glands situated above the kidneys. The most striking symptoms are bronzing of the skin, general weakness, feeble heart action and nausea. The disease often ends fatally within a short period of its commencement, but much is being done with gland extracts to combat its progress, although the results on the whole have been disappointing.

ADENITIS, or inflammation of the lymph glands.—It is due most commonly to poisons in the body, as the lymph glands act as filters; or, much more rarely, to the lymph-forming organs as in Hodgkin's disease. The condition may be acute from a septic abrasion, decayed teeth or acute eczema, or it may be chronic, as in diseased tonsils or tuberculosis. If the lymph tissues are unable to absorb all the poisons, an abscess of the gland may form.

Treatment is always that of the underlying condition, and the attention of a doctor or a dentist is needed. In tuberculous adenitis fresh air, nourishing food and cod-liver oil are essential.

ADENOIDS.—This is very common in children and is due to inflammation and swelling of the naso-pharyngeal tonsil. As the nose is blocked the child breathes through the mouth, thereby becoming an easy victim to bacteria and other impurities in the air which would have been filtered as it passed through the nose. In many cases the chest is poorly developed and, in untreated cases, the child soon begins to develop a characteristic appearance.

The nose appears pinched, the teeth become prominent, the mouth is always open and the face becomes expressionless. It is important that this disease should be treated early, as the effects may be very serious if allowed to run on too long. In slight cases it may not be necessary to operate, as the condition may clear up with open-air breathing exercises; but in the majority of cases the tissue should be removed.

ADRENAL.—Adjacent to the kidney.

AEROPHAGIA.—The swallowing of air. Commonly found in hysterical patients.

AFFERENT NERVES.—Nerves which carry impulses towards the central nervous system: sensory nerves.

AGUE.—The popular name for malaria. This disease used to be common in England, but is now almost entirely confined to cases where it has been acquired abroad. A fuller description has been given under MALARIA.

ALASTRIM.—A mild form of smallpox. The name is derived from the Spanish.

ALBINISM.—This is due to a lack of pigment in the skin. The albino is easily recognized by his white hair and pink or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

very weak eyes. No cure for albinism has yet been discovered.

ALBUMIN.—The protein found in most animal tissues. It contains carbon, hydrogen, nitrogen, oxygen and sulphur. The white of an egg (called albumen) is largely composed of albumin.

ALBUMINURIA.—The presence of albumin in the urine. Albumin may be temporarily present in the urine of people who eat a large amount of meat, but its continued presence often points to Bright's disease.

ALCOHOL.—Alcohol is commonly described as a stimulant, but this is not correct, as its depressant powers are greater than its stimulating powers. It blocks off the higher centres so that the mind has not the control of the body which it ought to have.

ALCOHOLISM, ACUTE.—The amount of alcohol necessary to produce drunkenness varies for every individual, and even for the same person in different circumstances. Constant use of excessive alcohol soon begins to leave its mark on the digestive system and upon the nervous system. Delirium tremens may follow a bout of excessive drinking. The patient imagines he sees all sorts of repulsive animals, may become violent, and is frequently suicidal. He should be watched until the attack passes off, as he may do himself an injury.

ALCOHOLISM, CHRONIC.—This is the result of habitual over-drinking, and the patient is advised to put himself under medical care and practise total abstinence.

ALIMENTARY CANAL.—The passage through which food passes from the mouth to the anus, through the pharynx, œsophagus (or gullet), stomach, small intestine and large intestine.

ALLERGY is a condition, present in certain individuals, which may be described as a chemical idiosyncrasy. People in whom it is present are handicapped by being particularly susceptible to one influence or a group of influences; they may inhale grass pollen and get hay-fever, or eat an oyster and get asthma, or touch a certain flower and get nettle-rash (urticaria). The cause of the condition is still obscure, but it is treated with some success by giving the patient adrenalin, ephedrine or peptone.

ALMONDS, OIL OF, POISONING BY.—The sweet almond is quite edible, but the bitter variety is very poisonous. The treatment is the same as for prussic-acid poisoning.

ALOPECIA AREATA.—The scalp is bald in patches. It usually affects young people, but recovery may be hastened by massage or the application of sulphur ointment, to be rubbed in every night.

ALUMINIUM.—The well-known silver-white metal of domestic and commercial use. It is used medicinally as an internal or external disinfectant, and in the alleviative treatment of rheumatoid arthritis.

ALVEOLAR ABSCESS (Gumboil).—A very painful abscess on the surface of the gum.

AMAUROSIS.—Old-fashioned term for any form of blindness which was not accounted for by any discernible structural defect in the eye.

AMBLYOPIA.—This term is derived from two Greek words which mean "dulled sight." Tobacco smoking may cause this, although it is very rare.

AMENORRHŒA.—This means the absence of, or cessation of, the menstrual periods. Sometimes menstruation never appears owing to maldevelopment of the womb. The natural causes for stoppage of the periods are pregnancy, lactation and change of life. Chlorosis, which is a form of anæmia, is one of the commonest causes leading to amenorrhœa; and sometimes shock, change of climate, exposure to cold or wet during the periods, or over-work may lead to a temporary cessation.

Treatment.—The cause must first be determined. If not due to pregnancy, lactation or the menopause (change of life), medical advice should be sought. A blood examination is necessary to diagnose chlorosis or anæmia, and a full examination must be made to be sure that there is no abnormality in the reproductive organs. The condition is sometimes a symptom of very serious disease, and should not be treated without skilled advice.

AMMONIA POISONING. — Every household is familiar with ammonia or spirits of hartshorn, and it is sometimes taken by mistake internally. An emetic should not be administered but very weak vinegar or lemon juice in water should be given freely.

AMNESIA.—Loss of memory, especially of the meaning of words.

ANÆMIA.—The condition which results from a lack of iron in the blood. The commoner types are (1) primary or constitutional anæmia and (2) secondary anæmia, the result of any excessive blood loss. The rarer and more serious pernicious anæmia is due to disease of the blood-forming organs.

Primary anæmia occurs most frequently in young women: the patient is very easily tired, complains of headaches, giddiness, palpitation and lack of appetite. There may be scanty, irregular or absence of menstruation and chronic constipation.

Treatment.—Rest, nourishing and regular meals, fresh air, attention to bowels and a prolonged course of iron under the direction of a doctor.

Treatment for secondary anæmia may

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

need to be much more vigorous and may even necessitate a blood transfusion.

In pernicious anæmia iron gives very little benefit, and injections of arsenic or liver extract over prolonged periods are essential. These do not cure, but help to control the relapses which tend to recur in this serious malady.

ANÆSTHESIA is a condition of partial or total insensibility; local anæsthesia is brought about by the injection of a solution of a drug into the tissues of the body or into a nerve; general anæsthesia is brought about by the administration of various drugs by inhalation, by the mouth, by injection into a vein or into the rectum. The discovery of general anæsthesia by ether was made by Michael Faraday in 1818, and its application to surgery was tried in U.S.A. in 1842 and adopted at Boston by Morton in 1846. A year later Sir James Y. Simpson of Edinburgh discovered the anæsthetic use of chloroform. For a generation or two chloroform remained the favourite anæsthetic; but with more modern methods of administration ether, which is less dangerous, has more and more taken its place. Nitrous oxide "gas" (often given in conjunction with oxygen) and ethyl chloride are popular and safe anæsthetics, and modern anæsthetists have evolved methods of prolonging their period of anæsthesia, which formerly had the disadvantage of being very short. Avertin is a general anæsthetic, of German origin, which is given by the rectum. Recent developments have been in the direction of giving drugs, such as Nembutal, to make the patient sleepy before administering the general anæsthetic, and so making for his greater comfort.

ANAL FISSURE.—A crack extending through the orifice of the bowel. It is a most painful and troublesome complaint, is usually the result of obstinate constipation and is caused by actual injury to the part by the passage of hard stools. The action of the bowels must be regulated with suitable laxatives, and the doctor may give cocaine suppositories for insertion into the bowel before a motion in order to relieve the pain which, without treatment, is often prolonged and severe.

ANAL FISTULA.—A small septic opening or sinus near the anus through which there is a discharge of pus. This is the outward sign of inward trouble as the discharge is from an abscess in the deeper tissues around the bowel itself. The abscess may burrow so that there is a secondary opening into the bowel. The treatment must be one for the surgeon.

ANAPHYLAXIS.—This condition results from the introduction into the body of a substance to which it is hyper-sensitive. Hay-fever is a very good example of this hyper-sensitiveness. (*See* ALLERGY; ASTHMA.)

ANASARCA.—The accumulation of the watery or serous part of the blood under the skin causing generalized swelling of all the tissues of the body—a diffuse dropsy.

ANEURISM.—An aneurism is a tumour caused by a circumscribed dilatation of the walls of an artery. An external aneurism, or aneurism of a limb, may be the result of an accident and may be treated surgically. The most serious form of aneurism is that of the aorta, or large artery, into which the blood from the heart is pumped. Surgery is dangerous, but some cases become cured naturally, a blood clot having formed. Medical treatment aims at assisting nature to form such a clot by slowing the bloodstream and making the blood more coagulable. Most cases of aneurism occur in people of over thirty years of age, due to disease of the walls of the arteries, and men are more frequently attacked than women. Syphilis may be a cause of this complaint.

ANGINA PECTORIS, sometimes called "breast-pang," is a very painful disease of the heart muscle or of the coronary arteries —the arteries which supply the heart. It is most common in middle age or old age and amongst the professional and upper classes, and men are more frequently attacked than women. A spasm of agonizing pain is felt in the chest, often accompanied by a feeling of tension as if the chest were encircled by a tight band. There may be a feeling of acute discomfort and anxiety amounting to a presentiment of approaching death, and sudden death may occur in any attack. A slight form of angina is sometimes met with in nervous persons, heavy smokers, or after an acute infection, such as influenza.

Treatment.—Prolonged rest is necessary and, after the first attack, life should be arranged so as to avoid unnecessary worries and sources of irritation. The diet should be simplified and constipation avoided. In fact, everything should be done to avoid the occurrence of further attacks, and the patient will do well always to carry in the pocket capsules of a powerful drug called amyl nitrite, which, when crushed and inhaled, may give instantaneous relief. Hot brandy and water may give relief, but in cases where these remedies fail, a doctor may have to give injections of morphia or a whiff of chloroform. Surgical intervention is sometimes undertaken.

ANGIONEUROTIC ŒDEMA. — An acute circumscribed swelling of the submucoid or subcutaneous tissues. It is an allergic disease and runs in families. (*See* ALLERGY.)

ANKLES, WEAK.—When the ankle

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

has a tendency to turn in, or over, it would be advisable to consult a reputable chiropodist, as the trouble is hidden in the feet, which may need manipulation or suitable supports.

ANKYLOSTOMIASIS. — Hookworm disease, miner's anæmia. A parasitic disease found in Britain chiefly among miners, but more common abroad. It is combated by stringent sanitary regulations.

ANOREXIA.—Defective appetite.

ANTE-NATAL DEATH.—Death of the fœtus in the womb at any time before birth.

ANTHRAX.—A very rare disease, communicated to man by animals infected with it. It may begin with a tiny red pimple which develops later into watery blisters, with considerable swelling. If the lungs become infected through inhaling infected dust there is very little hope of recovery. Injections of anti-anthrax serum is the only treatment of any value. The disease is commonly called "woolsorter's disease." In Britain, where the control of infectious diseases among animals is very strict, it is more or less limited to those who handle imported wool or hides. The bacillus was discovered by Louis Pasteur in 1881.

ANTIBODIES. — Constituents in the blood formed during an illness or following immunization against any disease. These antibodies are direct antagonists of the germ causing the disease.

ANTIMONY POISONING.—The symptoms are vomiting, abdominal pain and diarrhœa. Vomiting should be encouraged in the patient by administering tepid water followed by plenty of strong tea and, later, milk or white of egg in water.

ANTISEPTICS.—The object of an antiseptic is to destroy germs, and they are invaluable for dressing wounds and for sterilizing purposes. Such antiseptics as peroxide of hydrogen, boric acid and tincture of iodine should be in every home, as they are safe substances and can be used by any untrained person.

ANTITOXINS.—A counter poison or antidote produced by the body to counteract the toxins of bacteria. Antitoxins are used in the treatment of certain infectious diseases, notably diphtheria, tetanus and scarlet fever, and to convey immunization against these diseases.

ANUS.—*See* BOWEL.

ANUS, IMPERFORATE.—Some children are born without an anal opening through which the bowel contents can be discharged. An operation must be performed to remedy the defect.

APERIENT.—Anything which acts on the intestines and causes an increased movement of the bowels. In some people anxiety or fright may do this; others may be intolerant of certain foods. Generally, however, an aperient is a medicine taken as the need arises.

Some—lubricants like liquid paraffin—oil the bowel; others, like agar-agar, and psyllium seeds, increase the actual bulk of the motion, whilst the mineral salts, such as Epsom and Glauber, cause the evacuation to be much more fluid.

The vegetable aperients, senna, cascara, aloes and rhubarb, tend to make the bowel work more vigorously. Fruit salts and milk of magnesia are mild in their action, while castor oil is unequalled for a drastic purge.

If enough fluid, fruit, vegetables and exercise are taken, the constant taking of an aperient should not be necessary.

APHASIA.—Loss of the power of speech. It may be due to a tumour, blood clot, or disease of the brain. Sometimes the patient can still hear, but words mean very little to him; but he may be taught in the same way as a child and thus build up a new system of understanding.

APHONIA (loss of speech).—This may be due to a definite lesion, to hysteria and, in a few cases, to insanity. A form of voicelessness attacking clergymen is called "clergyman's sore throat," due usually to overstrain and bad voice production.

APOPLEXY.—This term applies to what is more commonly known as "a stroke," and is caused by disease of the brain. In an overwhelming majority of cases the trouble is due to a clot forming in one of the blood vessels in the brain. It therefore tends to occur in older people. According to the severity of the hæmorrhage, so is the severity of the attack. The condition may vary from sudden death to a temporary loss of speech, or numbness of one limb.

There may be no previous symptoms, but generally there is some danger signal such as giddiness, breathlessness or headaches.

The attack is usually sudden, the patient collapses, is completely or partially unconscious, the face is very congested, breathing is very noisy, and limbs may jerk on one side. This condition may last for hours or days, may be fatal or may gradually subside, and the paralysis may or may not disappear. Recovery, however, is always slow, very rarely complete, and the trouble usually recurs.

Treatment.—A medical attendant should be called in immediately and the patient moved as little as possible. His clothing should be loosened and the windows opened to admit as much fresh air as possible. The patient's head should be supported and the brow sponged with very cold water, but at the same time hot-water bottles should be placed at his feet to help to draw the blood away from the head. No food or stimulants should be given, as there is a danger of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

choking the patient. When signs of consciousness begin to return, great care must be taken to keep the patient absolutely free from any excitement or worry, and quiet and rest are essential.

The diet should consist of the lightest of foods, such as milk, soups and jellies, and a free action of the bowels must be kept up.

APPENDICITIS. — Appendicitis is caused by an inflammation of the vermiform appendix. There is much discussion as to what actually causes this inflammation to take place, but there can be little doubt that infection with germs is the immediate cause; the much-maligned "raspberry pip" has been found in such a small percentage of cases as now to be regarded as no evidence at all.

Indeed, different kinds of bacillus have been identified in connexion with this disease. Statistics indicate that younger people are more prone to be attacked than older. About half the recorded cases actually occur in patients under twenty.

In some cases a person may have a series of mild attacks which pass off, and with the disappearance of the painful symptoms the condition is forgotten. It is a mistake, however, to defer proper medical advice, for a recurrence in more severe form is always possible.

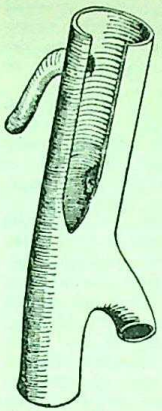
The chief and immediate symptom is severe pain all over the abdomen, but after about twenty-four hours it settles in the right lower part of it. If left untreated an abscess may form and the condition known as peritonitis sets up.

Treatment.—If the pain has not subsided after a few hours, the medical attendant will have to decide whether it is a case for operation or not. If no operation is to be done, much can be done to relieve the pain by placing a hot-water bottle near, but not on, the patient's side.

Food must be entirely fluid and, if necessary, an enema of soap and water may be used, but castor oil or other aperients must *not* be given.

APPETITE.—In a healthy, normal body the desire for food is necessary in order to maintain a well-balanced function of all the organs. Appetite is naturally greater in youth and also for those who are engaged in vigorous manual labour. Excessive appetite or loss of appetite is usually an indication of disease, and in children a craving for food may be a sign of worms.

ARCUS SENILIS.—This is the name given to a ring having a grey appearance which forms near the coloured part of the eye; it occurs mostly in old people, though young people develop it through fatty degeneration of the cornea. The circle never spreads to the centre of the eye, so never interferes with the sight.



Artery cut open to show interior

ARSENIC POISONING.—Owing to the Royal Commission set up to investigate the contamination of foodstuffs, arsenic poisoning is much less frequent than it used to be. The symptoms are vomiting and diarrhœa, burning pain in the stomach, followed by exhaustion. An emetic should be given immediately and milk, olive oil or strong tea administered. Most cases of criminal arsenic poisoning have been assumed at first to be enteritis or food poisoning, but they require a detective rather than a doctor.

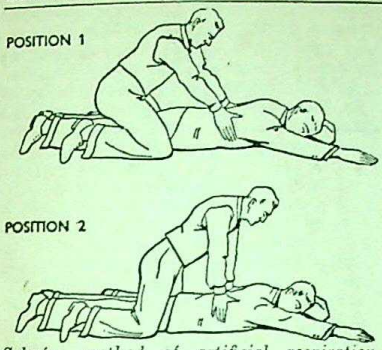
ARTERIO-SCLEROSIS.—A disease of the arteries, the walls being infiltrated with lime salts, and resulting in stiffness, weakness and tortuosity of the blood-vessels affected. In the aorta, the largest artery, the changes due to this disease are known as atheroma. Arterio-sclerosis is due to advancing years, to high blood pressure, or to syphilis, gout or chronic kidney disease. In an artery of the brain it is serious, as the vessel easily ruptures and gives rise to a cerebral hæmorrhage. The treatment is necessarily the treatment of the underlying cause, but little can be done for it.

ARTERY.—Type of blood-vessel, with strong walls of muscular and elastic tissue, which conveys the blood from the heart throughout the body. (*See* CIRCULATION OF THE BLOOD; VEINS.)

ARTHRITIS.—Inflammation of a joint or joints; it may be acute (rheumatic fever) or chronic (rheumatoid arthritis, arthritis deformans). Rheumatic fever is discussed under RHEUMATISM, ACUTE; rheumatoid arthritis and arthritis deformans probably group together diseases of quite different origins. In rheumatoid arthritis there is atrophy (shrinking) and erosion of the joint cartilage and bone, with pain and crepitations on movement; in arthritis deformans there is overgrowth of bone at the joints, creaking in the joint and limitation of movement. A common cause of chronic arthritis is an infection such as a tooth abscess, septic tonsils, or infection of an air sinus of the nose. When the cause is removed some improvement of the condition may result. The affected joints must be kept from getting stiff; massage and exercises are useful. Other alleviative treatments are given under RHEUMATOID ARTHRITIS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Schafer method of artificial respiration

ARTIFICIAL RESPIRATION. — Normally inspiration and expiration go on about fifteen to twenty times a minute, and if the body cannot get enough oxygen for one reason or another, asphyxia results, the breathing becomes irregular and may stop altogether. The heart does not stop at once, and the circulation of blood continues throughout the body; if, when the body is in this state, breathing can be started again, the individual makes a complete recovery. Common causes of asphyxia include choking on a piece of food, severe inflammation of the throat, and drowning. There are various methods of performing artificial respiration, and the most efficient and least tiring to the operator is nowadays acknowledged to be Schafer's. The patient is laid flat on the ground, face downwards and turned to one side, with a pillow under the lower part of his chest. The operator kneels across the patient's back at the level of his hips and places his hands flat on each side, over the lowest ribs, with his thumbs almost touching in the middle. Then he leans forwards, keeping the arms straight, and throws the whole weight of his body on to the back of the patient's chest, compressing it and exhausting all the air out of it. The pressure is kept up for two seconds, and then the operator raises his body so that the weight is taken off the patient's back, but the hands are kept in position. These movements are repeated about fifteen times to the minute, imitating the natural expansion and contraction of the lungs. In a person apparently drowned, any water that has been taken into the lungs escapes without interfering with the method of resuscitation, as, with the patient on his face, the tongue hangs downward and forward. The method can be kept up for hours without undue fatigue to the operator. Artificial respiration in the apparently drowned should never be given up till after at least two hours of effort.

ARTIFICIAL SUNLIGHT is the popular name for the method of treatment in which actinic rays from the carbon arc or the mercury vapour lamp are directed on to the body. The actinic rays are present at the ultra-violet end of the spectrum, while the heat rays are at the infra-red end of the spectrum, being found mostly in the light from the ordinary electric incandescent lamp. Artificial sunlight has been employed for a great variety of diseases. In rickets and in certain skin diseases its benefit is undoubted; its value in the treatment of tuberculosis is more doubtful, except in the case of lupus, or tuberculosis of the skin, in which the Finsen light (the light from a powerful arc lamp directed through a quartz lens) has been employed for many years with great success. In general, artificial sunlight treatment—when carefully regulated by a competent operator—has an excellent tonic effect even if it is not a specific cure for all the diseases for which it has been suggested; but it can cause grave harm if overdone or carelessly employed.

ASCITES, or dropsy, occurs when free fluid is present in the abdominal cavity. It is caused by any impediment of the circulation, such as serious heart disease or cancer of one of the abdominal organs. Frequently, the cause cannot be cured and then temporary relief must be given by the doctor drawing off some of the fluid by the method commonly called "tapping."

ASPHYXIA. — Any interference with breathing produces asphyxia. Acute inflammation of the air passages (diphtheria), a foreign body, inhalation of poisonous gases, drowning, electric or lightning shock are some of the most common causes. The patient gets black in the face, chokes and dies unless artificial respiration or a surgical operation is performed immediately.

ASTHENIA.—Absence of strength.

ASTHMA.—Although asthma affects the breathing, and the affected person has severe attacks of breathlessness and wheezing, it is not really a disease of the lungs at all. It is one of a small group called allergic diseases, which often run in families; one member of the family may have asthma, another hay-fever, another urticaria (nettle-rash) and another certain types of eczema, but these are all manifestations of various forms of allergy, which is a kind of poisoning peculiar to these individuals. Certain things act as irritants to them and bring on an attack of asthma; one man may get asthma at the seaside and another among the mountains; the breathing of grass pollen or the dust of feathers, the eating of shellfish, fish, strawberries, eggs, milk, aspirin tablets, are all examples of the diversity of things that may cause

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

asthma. Some cases are associated with affections of the nose, such as nasal polypi. A person affected with asthma may look as if he were going to die, but it never causes death; asthma is not a fatal disease though it may be a very troublesome one. Ephedrine, adrenalin and peptone are favourite and effective drugs used in the treatment of asthma. Asthma "cures" should be used with great care, and even hesitation, as some of them contain cocaine.

ATONY. — Want of muscular tone; debility.

AUTO-INTOXICATION. — A condition in which the metabolism of the body is faulty so that the individual is being poisoned by toxins which his own system is producing.

BACKACHE can be caused by any postural defect, so that this is a trouble which school medical inspections, remedial exercises and proper shoes should prevent. In acute illnesses, such as the fevers, influenza, rheumatism and lumbago, and kidney disease, the treatment consists of rest and warmth; massage and a purgative may help.

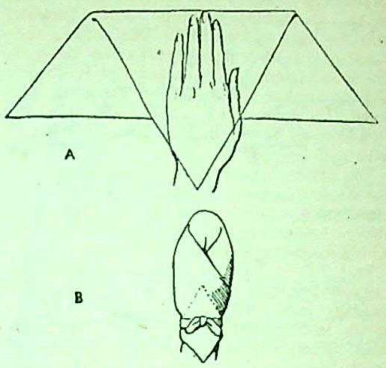
BACILLUS.—The rod-shaped form of bacterium.

BACTERIA are minute organisms (only visible through a microscope) which cause disease. Many have been isolated and studied. They vary in shape, size and habit. Some are spherical (*cocci*), rod-shaped (*bacilli*) or coiled (*spirillæ*). The pneumococcus, causing pneumonia, the staphylococcus, source of many abscesses and skin infections, the tubercle bacillus, causing tuberculosis, are all very common examples.

BALDNESS.—This is not always a sign of old age, and the number of causes and cures given would fill a small book. The most common cause, however, is dandruff of the scalp (*see* DANDRUFF). The scalp should be massaged daily for at least ten minutes with a stimulating lotion and the general health attended to, as more often it is general impairment of the health which causes falling-out of the hair. Cod-liver oil and sunlight baths are useful. (*See* BEAUTY CULTURE.)

BANDAGES AND BANDAGING.—Bandages are of two main types: triangular bandages and roller bandages.

Triangular Bandages are commonly used in ambulance and first-aid work, being simple in use, adaptable for different purposes and easily applied and removed. A triangular bandage is made by cutting diagonally across a square of unbleached calico or strong linen which is usually about two feet or a foot and a half in length along the side. This makes two



Triangular Bandage. A *shows bandage ready for the hand.* B *bandaging complete*

triangular bandages of a useful size.

The first use of the triangular bandage is as an *arm sling* to support an injured arm. The bandage is placed on the patient's chest so that the apex of the triangle lies beyond the elbow of the injured arm and the arm lies across the bandage with the hand at the middle of the base of the triangle. The lower end of the bandage is now lifted over the arm and brought up to the shoulder of the uninjured side, and the two ends of the bandage are tied behind the patient's neck. The hand of the injured arm must be above the level of the elbow. The apex of the triangular bandage is now brought over the elbow and fastened to the bandage in front with a safety-pin.

The triangular bandage is often used as a folded broad bandage by turning down the apex of the triangle until it touches the middle of the base, and then the top half of this bandage is turned down so that the two edges are parallel. This is the so-called "broad" fold bandage; the "narrow" fold bandage is made by turning down still farther the top half of the broad bandage, keeping the two edges parallel as before. These folded bandages are commonly used for tying round splints and holding them in position, the narrow one being the more generally useful. A bandage should be secured by tying it in a reef-knot, which does not slip, rather than by using pins; a reef-knot is tied by holding one end of the bandage in each hand, then passing the end in the left hand in front of the end in the right and twisting one end round the other; the left hand is then passed behind the right hand and the knot pulled tight.

The triangular bandage is useful for applying a dressing to an injury of the *head*. The base of the triangle is folded back about two inches and this is put on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

forehead just above the eyebrows, the apex of the triangular bandage being thrown over the back of the head. The ends of the bandage are then pulled round the sides of the head, crossing at the back of the head and meeting in the middle of the forehead, where they are tied. The apex is then turned up on to the scalp and fastened there with a safety-pin.

To apply a dressing to the *eye* the narrow-fold bandage should be used: it is placed obliquely across the eye, with one end above one ear and the other end below the other ear, and fastened in a reef-knot behind.

To bandage the *hand* turn a fold of about two inches along the base of the triangular bandage and lay it flat; the hand is placed on the bandage with the fingers towards the apex, which is folded back over the fingers up the forearm; the ends of the bandage are then fastened twice round the wrist and tied on the back of it, and the apex is pulled tight over the knot and fastened over the back of the hand with a safety-pin.

Bandaging the *foot* is carried out in a similar manner: a fold of about two inches is turned back from the base of the bandage and the foot is then put on the bandage with the toes pointing towards the apex, which is folded back over the toes up the leg. The two ends of the bandage are brought round the ankle, cross in front of the ankle and round the foot, being tied in a reef-knot in the front of the foot. The apex is then turned back over the knot and fastened with a safety-pin in front of the foot.

To bandage the *knee* the method is also similar: a fold of about two inches is turned back from the base of the bandage, and it is placed on the knee with the apex upwards and the base three or four inches below the knee. The two ends of the bandage are brought round the knee, crossed behind it and brought back over the thigh to the front, three or four inches above the knee-joint, and tied in a reef-knot on the outer side of the leg.

To bandage the *elbow*, a fold of two inches is turned back from the base of the bandage, and the arm placed on the bandage with the elbow about the middle, the apex pointing up the back of the arm towards the shoulder. The ends of the bandage are brought forward and cross in front of the elbow-joint, forming a figure eight, and tied on the outer side of the arm. The apex is pulled tight, turned over the knot and fastened with a safety-pin to the bandage.

To bandage the *chest*, the triangular bandage is placed on the chest, with the apex over one shoulder and the ends going under the arms to be tied in a reef-knot at the back. The apex is then pulled down at the back and fastened in a reef-knot to one of the ends of the other knot.

The *back* is bandaged in a similar way, the triangular bandage in this instance being placed on the back.

To bandage the *shoulder*, two triangular bandages are required: a fold of two inches is turned back from the base of one bandage, which is placed on the shoulder with the base four inches or so down the arm and the apex pointing up the neck. The ends of the bandage go round the arm and are tied on the front of it. The second bandage is folded as a broad fold bandage and put over the apex of the first, with its ends going round the body and tied under the armpit of the opposite side. The apex of the first bandage is now pulled tight, so that the bandage covers the shoulder closely, and brought down over the second bandage and fastened with a safety-pin.

A similar method, with two bandages, is employed to bandage the *hip*.

Roller Bandages are usually about five or six yards in length, made of muslin or calico, and varying in width from one inch to four inches; one-inch bandages are used for bandaging fingers or toes, two-and-a-half-inch for bandaging the head or arms, three-inch for the legs, and four-inch for the trunk. Roller bandages are rolled up tightly before use and are usually fastened with safety-pins. The method of using a roller bandage is for the operator to hold the bandage, rolled up, between the fingers and thumb of his right hand and begin by making two or three fixing turns of the bandage, firmly and with equal pressure, around the part to which it is first applied. A limb should always be bandaged from below upwards and the bandage should pass from the inner to the outer side across the front of the limb. Each turn of the bandage should overlap two-thirds of the previous turn, the margins kept parallel, and all the crossings and reverses in one line. The bandage should be applied firmly but not tightly, or it will interfere with the circulation of the limb and cause discomfort or pain. When bandaging the forearm or the calf, it will be noticed that although at first the turns of the spiral bandage lie

Roller bandage being applied to the arm

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

evenly, as the girth of the limb varies the edge of the bandage becomes loose. This is avoided by "reversing" the bandage, turning it over so as to change the upper and lower edges and thus grip the limb to which it is applied. To keep the bandaging neat, all the crossings or reverses should be kept in a straight line.

A "figure-of-eight" bandage is applied at the knee or the elbow, where neither a simple spiral nor a reversed bandage is sufficient; as the operator approaches the knee, for instance, he carries the bandage round the back of the joint upwards to appear above the joint in front and then down behind and round to appear in front of the joint below and just above the last turn, repeating the method until the whole joint is gradually covered with a firm bandage.

A "four-tailed" bandage is made by taking a piece of wide roller bandage about three feet in length. Double it and split it down the centre to within a few inches of the fold. A small cut is then made along the centre of the uncut part from the fold. The bandage is then opened up and is used for applying dressings to the jaw or for holding the jaw firm in cases of fractured jaw.

A "T-shaped" bandage is made by stitching two pieces of three-inch bandage together to form a T, the horizontal limb about four feet long and the vertical limb about three feet. The vertical limb is then cut up the middle, making a double T, and it is used for applying dressings to the perineum, the horizontal limb being fastened round the waist, while the narrower vertical limbs go between the legs.

A "many-tailed" bandage is made by stitching several pieces of three-inch bandage, each about four feet long, to a long vertical piece; used to hold dressings on the chest or abdomen, each piece overlapping the preceding, and the top fastened with a safety-pin.

BANTING.—A treatment of obesity called after its originator, William Banting, 1797-1878. The method consisted in deleting carbohydrates from the diet and using nitrogenous food.

BANTING, FREDERICK GRANT.—Canadian physician who introduced the method of treating diabetes by insulin.

BARBER'S ITCH.—An obstinate disease, also called sycosis, which affects the moustache and beard areas of the face. It is an infection of the hair roots, which causes spreading sores and pustules with considerable irritation. It used to be very difficult to deal with, the cure sometimes taking a matter of years. Nowadays, however, the use of penicillin clears up the condition quickly and easily.

BARTHOLIN'S ABSCESS. — An abscess of Bartholin's glands, which are a pair of small glands secreting mucus just inside the entrance of the vagina. The abscess is painful and requires surgical attention.

BATHS.—The taking of baths for cleansing or for cure goes back many centuries, for it is a long-established fact that impurities of the body pass out through the pores of the skin. Anything which facilitates this process of elimination, such as heat, friction, herbs or chemicals, adds to the health-giving properties of the bath. Soap and water are necessary for health and comfort to oneself and to others, while sea-water bathing is stimulating to the skin and limbs. After taking a large meal, however, some time should be allowed to elapse before venturing in for a swim. Medicinal baths are to be found in practically all countries, and owe their origin to the healing properties of certain substances found in the local soil and water. In Great Britain, Bath and Harrogate, among other spas, have long been famous. Of recent years, in order to combat the crippling effects of rheumatism and arthritis, clinics have been opened where vapour, radio-active mud, aromatic herb, electrical, sunlight, foam and compressed-air baths are prescribed and supervised by specialists.

BEAUTY CULTURE.—The foundation of beauty is good health, for, while a homely countenance can be radiant when the complexion is clear and the eyes bright, the most classical features can be spoiled by a sallow complexion, a blotchy skin, dark lines under the eyes and lines at the side of the mouth. Sensible living and healthy surroundings, then, without over-eating, a simple and not faddy dietary and moderate exercise are the chief essentials for beauty. There is no harm, however, in making the most of oneself, and nowadays every woman, even though she may not be a great beauty, must look *soignée* and properly cared for. That does not necessarily mean that the finger-nails must be cut to a point and varnished red; over-manicuring is worse than under-manicuring. So far as the *finger-nails* go, they should be short, scrupulously clean, and show the half moons at their bases. A few simple manicure implements are a great help: a pair of nail-scissors, a nail-file, an emery board, a packet of orange-sticks, nail-powder and a polishing pad and some cold cream comprise the outfit. For the weekly manicure the hands should first be soaked in a lather of soap and hot water for about five minutes —this makes the hard skin at the bases of the nails soft—and with an orange-stick dipped in the cold cream the skin at the bases and sides of the nails is pushed back all round. The ends of the nails are then evenly trimmed with the scissors and filed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to make them smooth. After drying the hands, a little powder is dabbed on each nail and they are polished with the pad until they shine. With such a weekly manicure all that it is necessary to do daily is to push back the skin with the orange-stick and cream, file the ends and polish.

For the *skin and complexion*, soap and water, fresh air and the prevention of constipation are the best things in the world. An orange or a glass of hot or cold water first thing in the morning helps to prevent constipation and dyspepsia. A tepid bath is just as good, if not better, for most people than the daily cold bath. If the water is a hard water it is best softened with a teaspoonful of borax. If the skin is inclined to be greasy it is advisable to put a little oatmeal in the water. No trace of soap should ever be left on the skin: it should be washed off thoroughly. If the skin feels rough after being in the fresh air, it is best to rub in a non-greasy face cream and leave it on for five or ten minutes before washing it off in softened warm water. There is no harm in face powders so long as they are good; cheap face powders are a false economy, as they may contain harmful ingredients.

The *hair* is similarly best cared for by looking after the general health. The hair cannot be good unless the scalp is clean and healthy, and once a week the scalp should be washed thoroughly with soap and water. The soap must be all carefully washed out again with warm water, followed by cold. If dandruff is present, the head should be washed daily with equal parts of soft soap and spirits of wine, rubbing a good lather into the scalp. Rinse this out again completely and dry the scalp well. Never let the hair remain wet. If the scalp is too dry, rub in a little castor oil or liquid paraffin. If the dandruff is bad, sulphur ointment or a dilute mercury ointment should be rubbed into the scalp at bedtime. Hair brushes must be looked after properly and kept scrupulously clean. *Grey hair* can be arrested if it is premature, but there is no cure for the grey hair that advancing years bring.

Dyeing the hair should not be undertaken without competent advice; there are some harmless hair dyes to be obtained nowadays but this is not a thing to be advised, as some people will look older with dyed hair than with grey hair. *Baldness* in young people is usually due to an unhealthy condition of the scalp due to the "bottle bacillus," which causes dandruff: this is treated as mentioned above. In middle-aged people, when it is due to advancing age, the only thing to do is to improve the blood supply to the scalp by rubbing in a menthol ointment and to improve the general health by taking cod-liver oil or halibut-liver oil and having sunlight baths twice a week or oftener.

The *eyelashes and eyebrows* may be improved in condition by rubbing in a little cocoa butter every night. Plucking the eyebrows may be fashionable, but it is not a thing to be advised, as the moment it is stopped the eyebrows will get bushier than ever before. If the eyes are red they should be bathed in a weak solution of bicarbonate of soda (one teaspoonful to a pint of warm water) rather than the commonly used boracic powder.

Blackheads are best prevented by carefully washing all soap from the face; when they are present sulphur ointment should be well rubbed into them every night. *Wrinkles* are due to poor condition of the under layers of the skin, and their most common causes are worry, overwork and bad temper. The best preventive is a healthy life and avoidance of undue worry, which is a habit of mind. A good skin food well rubbed in every night will prevent the skin from becoming dry and impoverished. *Face massage* should always be done very gently round and round and upwards, rubbing in the skin food all the time with the palms of the hands, for about ten minutes. Face massage not only helps wrinkles to disappear, but is a good general skin tonic. *The figure* is best aided by what has already been said about leading a healthy life and having *moderate* exercise—not too much or too little. Those who cannot play games should do ten minutes' simple exercises in the bedroom morning and evening.

Obesity can be controlled by a suitable dietary: avoid fats, sugars and starches, take liquids only two hours after food and then in small quantity. The starches (which include bread and potatoes) are the most difficult ones to avoid; take instead thin dry toast or unsweetened biscuits. Take plenty of lean meat, fish, salads and fresh fruits; no beer or stout; moderate exercise daily.

BEDSORES.—These may occur in the case of any patient who is confined to bed over a long period. They are especially likely in patients who must not alter their position, or who are helpless and have no control over the bladder and bowels. The skin over the "pressure parts"—the buttocks, lower parts of the spine, shoulders and back of the heels—becomes red and tender through impaired circulation. Finally the skin may break and the bedsore form. The aim of all good nursing is to prevent this condition. The bed should be carefully made, the patient placed on an air cushion and the pressure parts rubbed with surgical spirit and dusted with powder night and morning. The greatest difficulty arises with patients who get wet

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

or soiled. This means constant careful and scrupulous nursing. Zinc and castor oil or Flavine and liquid paraffin can be applied to an actual bedsore, if such should develop in spite of precautions, or in their absence.

BED-WETTING.—In normal children control of the bladder by day and night should be established at 2½ years; boys tend to be later than girls. In those cases where bed-wetting continues beyond that age the cause can be due to some organic defect, but in a great majority of cases it is of nervous origin. Parents must be patient, avoid scolding and praise any progress made. Adequate fluid should be given up to mid-day, but none after about 4 p.m.; the child should be "lifted the last thing." In very obstinate cases a doctor will give a nightly sedative.

BELLADONNA POISONING.—Belladonna is familiar to most of us under the name of deadly nightshade. The berries are often eaten by children, but it is the root and leaves which contain the most poison. The mouth becomes dry and the patient becomes excited and occasionally unconscious. An emetic of mustard and water should be given immediately, followed by a stimulant such as strong tea, brandy or whisky.

BELL'S PALSY.—*See* FACIAL PARALYSIS.

BENIGN TUMOURS.—Benign tumours are tumours which are not dangerous to life, as distinguished from malignant (cancer) tumours, which are.

BERIBERI.—It has been known for many years that this disease is due to eating white polished rice. When the rice has been over-milled it removes the outer husk, which contains a vitamin necessary to the diet. This disease is very prevalent in the East, where rice is the chief food. Beriberi attacks the nerves of the body and produces a numbness in the limbs. Plenty of milk and eggs and meat should be given to the patient, as these contain the vitamins so necessary to him.

BILE.—The substance secreted by the liver and collected in the gall-bladder. It is golden-brown in colour and very bitter to the taste.

BILHARZIASIS. — This disease is caused by a parasitic worm which enters the bladder or rectum and causes blood to be passed with the urine. The bladder becomes inflamed and any muscular activity should be avoided. Much can be done to cure this disease by injections of tartar emetic into the bloodstream.

BILIARY COLIC.—The colic accompanying the passage of a gall-stone is of a very severe nature. It may require morphia for its relief. (*See* GALL-STONES.)

BILIOUSNESS.—This term is often applied to sick headaches arising from eye-strain, etc., which have very little to do with disorder of the liver. Biliousness arises from excessive indulgence in food or drink; or, maybe, lack of exercise or constipation may bring it on. The patient should rest well and eat as little as possible; doses of Epsom salts in the morning are advisable.

BIRTHMARKS.—Any mark found on the skin at birth constitutes a birthmark. Such marks are commonly called moles, strawberry marks, port-wine stains, and are known as nævi. There is very little known about the cause of these marks, and the only way of treating them is by electrolysis or by surgical operation.

BITES.—For troublesome insect bites and stings apply strong bicarbonate of soda, diluted ammonia water, or calamine lotion. In the case of a bee or wasp sting, if there is nothing else handy rub with an onion or burdock leaves or hold the domestic blue-bag on the sting. In the case of a bee sting the sting should be sought for and removed. Gnat and mosquito bites can be so irritating if they are numerous that people who are liable to be much bitten should dab their faces, arms and legs with some strong-smelling substance such as oil of lavender or citronella before going out at dusk. Any bite or sting which has become infected may cause a grave constitutional disturbance and a doctor should be consulted.

BLACKHEADS. — Yellowish pimples with a black point in their centre; usually found as the disease acne. (*See* ACNE; BEAUTY CULTURE.)

BLACKWATER FEVER.—This is a tropical disease which derives its name from the colour of the urine, which is dark red or black owing to the presence of blood. The symptoms are shiverings, bilious vomiting and dark urine; the patient should go to bed immediately, as sudden death from heart failure is quite common. Calomel should be administered, and quinine only under the direction of a medical attendant. The value of good and careful nursing cannot be over-estimated.

BLADDER.—The organ into which urine, the fluid waste matter from the kidney, passes and is stored until sufficient is collected to stretch the muscular wall of the organ. This stretching causes the muscles to contract, and the bladder is then emptied, the urine passing out through the urethra. The average storage capacity is about a pint.

BLADDER, INFLAMMATION OF.—*See* CYSTITIS.

BLADDER, IRRITABLE.—Sometimes over-excitement, nervousness or too acid urine will cause a desire to pass water a little more frequently than usual. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

treatment is to try to remove the cause of the trouble.

BLADDER, STONE IN.—Urinary calculi or stones in the bladder may be caused by sluggish action of the bladder or abnormal constituents of the urine or both these conditions. The calculus is formed by a collecting together of crystals formed by the solid constituents of the urine, such as uric acid, oxalate of lime and phosphates. If these are deposited before the urine is passed, they remain in the bladder as gravel and may form stones. The condition is more common in men than in women—dietetic errors are usually responsible, but the hard drinking water in some districts is liable to increase the tendency as hard water contains a greater proportion of lime than soft water. The treatment is usually surgical.

"BLEEDERS."—The popular name for persons suffering from hæmophilia.

BLEEDING.—*See* HÆMORRHAGE.

BLINDNESS.—Lack of the power of seeing. This condition may be due to damage to, or abnormality of, the actual organ of sight, the eye, or to the nerve controlling the eye. Colour-blindness is a fairly common condition, which has become more important with the introduction of aviation, since colour-blindness is a definite disadvantage to the flyer. The same applies to the lack of stereoscopic vision. Snow-blindness may arise from the glare of the sun on snowfields. (*See also* AMAUROSIS.)

BLISTERS.—These are met with in various skin diseases, but also are produced artificially to afford relief in certain illnesses. (*See also* BURNS AND SCALDS.)

BLOOD is a complex chemical fluid. Through its red blood corpuscles the body is supplied with iron and oxygen. The white corpuscles are the defence force of the body and are active in disease. The pump action of the heart circulates the blood throughout the body, by the arteries to the tissues and from the tissues by the veins. Arterial blood is much redder than venous as it contains the oxygen. Blood coagulates when exposed to the air, splitting up into a red clot and a clear yellowish fluid called serum. This coagulability is the body's protection against undue hæmorrhage whenever a blood vessel is damaged.

BLOOD-POISONING.—Whenever there is a source of infection, whatever its cause, some toxins circulate in the bloodstream with accompanying fever and malaise. If the illness becomes more serious the germs themselves get into the bloodstream and the patient is far more seriously ill, with high temperature, sweats, extreme weakness and perhaps even delirium. This condition is known as septicæmia.

BLOOD-PRESSURE. — This really means the force with which the blood is propelled through the arteries, and the pressure can be measured by an instrument called a sphygmomanometer. Low blood-pressure occurs in debilitating diseases and it produces a feeling of great general weakness. High blood-pressure may be produced by kidney disease or by poisons absorbed into the body. The condition gives rise to headaches, sleeplessness, fatigue and giddiness, and a quiet life and careful non-stimulating diet are advisable for those patients suffering from it.

BLOOD-SPITTING.—*See* HÆMOPTYSIS.

BLUE BABY.—A baby born with congenital heart disease.

BLUSHING.—This occurs mostly in young people and is commoner in women than in men. It is usually a sign that the person is embarrassed, self-conscious or shy. There is no remedy for this except sensible training of the mind.

BODY-WEIGHT. — The table given below shows average heights and weights of boys and girls and of men and women, but it should be remembered that quite healthy individuals show considerable divergencies from the average without ill-effects. Boys are rather taller and heavier than girls during the first five years of life, but at the age of twelve girls begin to gain on boys in both height and weight. After the age of fifteen boys again grow in height and weight more than girls, and may go on growing until the age of 22 or 23, while most girls cease growing at 18 to 20.

TABLE.—Average height without shoes, and average weight with clothes.

	Males				Females			
	Height		Weight		Height		Weight	
Age	ft.	in.	st.	lb.	ft.	in.	st.	lb.
1	2	5½	1	4½	2	3½	1	4
2	2	8½	2	4½	2	7	1	11½
3	2	11	2	6	2	10	2	3½
4	3	1	2	9	3	0	2	8
5	3	4	2	12	3	3	2	11
6	3	7	3	2½	3	6	2	13½
7	3	10	3	7¼	3	8	3	5¾
8	3	11	3	13	3	10½	3	10
9	4	1¾	4	4½	4	0¾	3	13½
10	4	3¾	4	11¾	4	3	4	6
11	4	5½	5	2	4	5	4	12
12	4	7	5	6¾	4	7½	5	6½
13	4	9	5	11½	4	9¾	6	3
14	4	11½	6	8	4	11¾	6	12¾
15	5	2½	7	4¾	5	1	7	8½
16	5	4½	8	7	5	1¾	8	1
17	5	6¼	9	5	5	2½	8	3½
18	5	7	9	11½	5	2½	8	9
19	5	7½	9	13½	5	2¾	8	12
20	5	7½	10	3¼	5	3	8	11½
21	5	7½	10	5	5	3	8	10
25–30	5	7¾	10	12½	5	2	8	8
31–35	5	8	11	6	5	1	8	9

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOILS AND CARBUNCLES are skin abscesses. A boil starts as a hard, red, painful spot, which may gradually develop a yellow head through which the pus discharges. Some boils remain "blind," and subside without any pus discharging. In other cases, the condition both local and general, increases in severity; swelling and redness extend, with severe pain and raised temperature. The patient becomes really ill, for the infection has involved the deeper skin areas. When the lesion discharges, either naturally or by surgical means, the discharge may go on for several days and no sign of healing occurs until the central core or slough separates.

Treatment.—In the first place, poultices of kaolin or Epsom salts and glycerine must be applied and the bowels should be well moved. Food should be light and nourishing and in all severe cases a doctor should be consulted.

CARBUNCLES.—This is often looked upon as a collection of boils, but it is really more than this, as the infection is more deeply seated and the symptoms more severe. There is always a certain amount of blood poisoning accompanying an abscess, thereby causing great exhaustion to the patient. Strength must be kept up with a liberal diet and the medical attendant should prescribe a tonic. The treatment is much the same as for boils; but it is advisable to call in a doctor.

BONES AND JOINTS. — The bones which make up the human skeleton are about 200 in number and are of three types, namely long bones, such as the humerus or arm bone; flat bones, such as the bones of the top of the skull; and short bones, such as the vertebræ. If a long bone is cut through it will be seen that the outer part is dense or compact and then gradually it gets more spongy or open, with spaces between the bony elements, while in the middle is a hollow space containing the marrow, which is composed of fat and blood cells, from which blood corpuscles are developed.

Flat bones are almost entirely composed of compact bony tissue, while by contrast short bones are almost entirely of spongy or cancellous tissue. In the early stages of the development of the human body the bones are represented by membrane; later this becomes cartilage, which in turn becomes calcified and eventually becomes true bone. The long bones develop in three parts, the middle being joined by cartilage to the two ends, and it becomes complete bone only at about the age of twenty. There are over 200 joints in the body, of various types: ball-and-socket joints, such as the hip, can move in all directions; hinge-joints, such as the elbow, in only one direction; rotary joints, such as the joint between the two top vertebræ, the atlas and axis, in a rotary direction. The joints are held together by strong fibrous bands called ligaments; the surfaces of the bones which touch each other, in the formation of a joint, are covered with cartilage, and the joints are kept freely movable with a fluid secreted by their membranous lining.

BONES, BROKEN.—*See* FRACTURES.

BONE, DISEASES OF.—*Acute inflammation* of a bone, or *osteomyelitis*, is a serious condition which requires the attention of a surgeon; the bone is very tender and the temperature is high. *Chronic inflammation* of a bone is not infrequently due to tuberculosis and should be examined by a doctor. *Rickets* is a chronic disease of bones, usually seen in children under three years and due to improper feeding and bad hygienic conditions; it is much less common than it used to be, due to improved conditions.

Tumours of bone are, unfortunately, most commonly of a malignant type, sarcoma, diagnosed chiefly by X-ray examination and requiring urgent surgical attention. *Periostitis*, or inflammation of the membranous covering of a bone, may be acute or chronic and in any case requires treatment by a doctor without delay.

BOTULISM.—A severe form of food-poisoning due to the bacillus botulinus. It is very often fatal and is sometimes due to infected canned vegetables, which should never be used if they are not in perfect condition. (*See* FOOD-POISONING.)

BOWEL.—The bowel includes the *small intestine*, about 20 feet long, in which the absorption of the food chiefly takes place, and the *large intestine*, about 5 feet long, which includes the *cæcum*, the sac-like portion into which the small intestine opens and which has the *vermiform appendix* at its blind end, and also the *ileac colon*, *the ascending*, *transverse* and *descending colons*, the *pelvic colon*, the *rectum*, the dilated part just before the end of the bowel, and the *anus*, the opening on to the surface, kept tightly closed by strong muscular fibres surrounding it.

BOWELS, CATARRH OF. — Young children may develop catarrh of the bowels through bad feeding or during the teething period, or it may be due to cold. Several motions of a greenish, slimy nature are passed daily, and the pains and diarrhœa may continue for several weeks. Small doses of castor oil should be given until the diarrhœa ceases or, if it still persists, 10 to 20 grains of sublimate of bismuth should be given daily. In older children plenty of nourishing foods, such as beef-tea, fish, and milk puddings, should be given, and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

should be taken out for as much fresh air and exercise as possible.

BOWELS, CONSUMPTION OF.—*See* TUBERCULOSIS.

BOWEL, FALLING OF, OR PROLAPSE.—This condition occurs mostly in children, where the muscle of the anus is weak. It may follow persistent constipation. The prolapse shows itself as a bright red, slimy swelling which protrudes through the anus. The bowels must be regulated, the anus lubricated with Vaseline before defecation and after the bowels are moved. The prolapse should be replaced with a pad wrung out in cold water. The child should be examined by a doctor.

BOWELS, INFLAMMATION OF.—This is either enteritis or colitis, according to whether the small or large bowel is affected primarily.

It can be caused by contaminated food, by faulty diet, by chill, by germs, or it may be part of a general illness such as influenza. The symptoms are vomiting and diarrhœa, with varying degrees of temperature. Vomiting is much more pronounced in infections of the small bowel, and the accompanying pain is generally above the navel. In many cases the stomach also is infected and the condition is one of gastro-enteritis, or the inflammation may spread to the liver, blocking the bile ducts and causing jaundice. In colitis the pain is below the navel, there may be much greater tendency to strain at stool and there may be the passing of blood. Colitis is apt to become chronic.

Treatment.—In simple cases, a day's starvation with an initial dose of laxative is sufficient, followed by a luke-warm diet of milk, cornflour and broth. Other cases need medical attention, for the condition is exhausting, and, in children and the aged, dangerous.

BOWELS, OBSTRUCTION OF.—This is commonly termed "stoppage." It can occur in young and old in many conditions. The obstruction can be inside the bowel, pressure from outside or from twists of the bowel itself. In the first of these groups, the results of extreme constipation can form such a hardened fæcal mass that straining fails to move it. Growths can press on the bowel from without or block the bowel from within. Herniæ result from a knuckle of gut being caught in one of the gaps of the abdominal muscle wall. In the very young, intussusception (when a piece of bowel slips back into itself) blocks the passage of the motion. In elderly people, a loop of bowel may twist, causing a similar hold-up. The symptoms are complete constipation, colic, a tense, tender abdomen and, in neglected cases, vomiting. Sometimes an enema or injection through the rectum will relieve, but this should be done only under medical advice, which should be sought without delay in all cases.

BOWELS, ULCERATION OF (*Ulcerative Colitis*).—Typhoid fever and dysentery practically always cause ulceration of the bowels. Severe constipation may set up this condition, also tuberculosis.

BOW-LEGS.—This condition usually arises from rickets or from the parent allowing the child to walk while the bones are still soft. In young children the deformity often corrects itself as the child grows. A light splint may be used and massage applied to the legs. Care should be taken that the diet contains the necessary quantity of bone-forming vitamins, viz. cod-liver oil.

BRAIN.—The brain weighs about 48 oz. and consists of the two hemispheres of the *cerebrum*, which is the main part of the brain, the *cerebellum*, which lies below and behind the cerebrum, the *pons varolii*, which bridges over the short stalk connecting the cerebrum and the spinal cord, and the *medulla oblongata*, the bulbous continuation of the spinal cord under the skull. The brain is covered by three membranes, the *dura mater*, the outer one; the *arachnoid mater*, the middle one; and the *pia mater*, the inner one which goes right down into the convolutions on the surface of the brain. The *cerebro-spinal fluid* lies between the middle and inner membranes and unites the brain, acting as an additional protection to it. The outer membrane has under it a large number of venous sinuses to convey the blood away from the brain. The substance of the cerebrum consists of an outer layer of grey matter containing groups of nerve cells which carry out the functions of the brain, while the inner substance of the cerebrum, or white matter, consists of nerve fibres held together with connective tissue. The functions of the cerebrum concern the higher faculties of thought, memory, the will, intelligence and the senses; the cerebellum has a controlling influence on the nervous system generally, and especially on the co-ordination of the movements of the body. The pons varolii and medulla oblongata govern physiological processes such as breathing, the beating of the heart, vomiting, etc. It has been shown, chiefly by the experiments of Horsley and Ferrier, that different parts of the cerebrum control different functions; for example, immediately in front of a deep convolution, the fissure of Rolando, is an area which controls the movements of all the different parts of the body, the area on one side of the brain controlling the opposite side of the body. The front part (frontal lobes) of the cerebral hemispheres are believed to be the seat of the intellect; at the very back (the occipital

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lobes) is an area which has to do with the sense of sight; a centre dealing with the sense of hearing is situated at each side in temporal lobes, and on their inner sides are the centres of taste and smell. There are still parts of the brain of which the functions have not yet been ascertained.

BRAIN, COMPRESSION OF. — This may be due to a heavy blow on the skull; blood may accumulate and press on the brain, causing unconsciousness and paralysis. The only treatment is operative.

BRAIN, CONCUSSION OF. — Concussion may cause the patient to feel dazed for only a few moments, or sometimes for some hours, or he may be quite unconscious for a few days. Severe headache, giddiness and nausea are felt when he regains consciousness. The patient should be put to bed in a darkened room and kept absolutely quiet. Cold compresses applied to the head may relieve the pain and a laxative should be given if the bowels require attention. Medical aid should be sought at once in all cases. If possible, a month's complete rest, free from all worry, should be taken before resuming ordinary activities.

BRAIN, CONGESTION OF. — The brain may become gorged with blood, with the result that the individual becomes irritable and giddy and suffers from headache, sleeplessness, or may alternatively become dull and drowsy. In very severe cases there may be delirium, fits and loss of consciousness. The patient's head should be kept raised, and rest, quiet and freedom from work and worry aimed at. All alcohol must be strictly avoided. Blood-letting may have to be resorted to.

BRAIN FEVER. — *See* MENINGITIS, SUPPURATIVE.

BRAIN, INFLAMMATION OF.—*See* CEREBRO-SPINAL FEVER; ENCEPHALITIS LETHARGICA; MENINGITIS, SUPPURATIVE; MENINGITIS, TUBERCULOUS.

BRAIN, WATER ON.—*See* HYDROCEPHALUS.

BREAST.—The breasts form prominences on the front of the chest, extending from the third to the seventh ribs, and are glands which in the female secrete milk but which in the male are merely rudimentary. The breast is composed of a number of glandular lobes arranged in a circle and bound together by fat and connective tissue, a duct proceeding from each lobe and opening on the apex of the nipple. During pregnancy the breasts become enlarged and very shortly after the birth of the child they begin to secrete milk and continue to do so as long as the baby is being suckled, usually for about six to eight months.

Inflammation of the breast is usually due to infection of a cracked nipple; this can be prevented by bathing and drying the nipples immediately after nursing a baby; but when the inflammation has developed it is treated by supporting the breast by a broad bandage and applying hot fomentations.

Abscess of the breast requires surgical treatment, as if one waits for the abscess to burst it may have burrowed deeply into the tissue of the breast and take a long time to heal. A *tumour* of the breast should always be examined by a doctor; it may only be chronic inflammation, which is not very serious and only requires support by a bandage. It might happen to be cancer, and the sooner it receives treatment the better is the chance of recovery. Even with advances in surgery and with modern radium treatment the mortality of cancer of the breast is high, so the importance of early diagnosis will be realized.

BREATH, OFFENSIVE.—This may arise from indigestion or constipation, and by treating these disorders the breath may become clean again. Bad teeth are very often the cause of offensive breath, or the gums may be soft and unhealthy. Formamint tablets or any good mouthwash will do much to remedy this complaint. Septic tonsils are a common cause of bad breath and may require operation. Sometimes the antrum is at fault and a slight operation may be necessary to correct this in order to allow the whole of the discharge to drain away.

BREATHING, DIFFICULTY OF.—Many people are of the opinion that when they find themselves becoming breathless they have heart disease. It is indeed a sign of distress, but not necessarily always a serious one. A nervous shock or great exertion will leave a man breathless, and it is a well-known fact that an athlete can carry on for a long time after he gets his "second wind." Breathlessness occurs during attacks of fever, pneumonia, bronchitis and affections of the heart. Adenoids in children will cause them to go about with the mouth open, and croup often causes very alarming breathlessness. The treatment naturally will depend on the cause of the breathlessness, but rest in bed, propped up with pillows, will ease the patient a great deal.

BREATHING, MECHANISM OF.—*See* RESPIRATION.

BRIGHT'S DISEASE. — Medically known as nephritis, this disease was named after Dr. Bright, who in 1827 published the first descriptions of it. It is an inflammation of the kidneys and is supposed to be more common among men than women. Acute Bright's disease may come on during an attack of scarlet fever, or exposure to severe cold may be the cause of onset. The disease usually begins with feverishness

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and headache, a furred tongue and constipation. The skin is hot and dry and the face may be "puffy." The urine is usually dark in colour as it contains albumin and sometimes blood.

Treatment.—The doctor should be called in at once as some cases quickly develop into the chronic stage, which in the majority of cases proves fatal. The patient should be put between blankets and kept warm with hot-water bottles. The bowels should be kept open and plenty of water given to keep the kidneys working if possible. Hot packs applied to the skin help to get rid of some of the poison by promoting sweating. The diet should consist of the lightest of foods only; at first nothing but liquids should be given, and milk and milk puddings along with fresh vegetables and fruit should be the staple diet.

Chronic Bright's Disease.—This may follow an attack of acute Bright's disease, or may be set up by drinking too much alcohol; it may be due to lead poisoning or chronic disease of the arteries. In cases of this disease the outlook is serious because the kidneys cease to function adequately and very often slow blood-poisoning leads to a fatal issue.

BROMIDROSIS.—An abnormality of the sweat glands in which the sweat has an offensive odour.

BRONCHIAL TUBES OR BRONCHI.—The tubes leading from the windpipe to each lung. Objects swallowed which "go down the wrong way" catch the entrance to the bronchial tubes.

BRONCHIECTASIS is the condition of dilatation of the bronchial tube so that a pocket of secretion forms. This often becomes infected and purulent. It may follow the inhalation of some foreign body or be a complication of chronic bronchitis.

BRONCHITIS, ACUTE. — Bronchial catarrh is very common in cold, wet climates, and it is most unusual for the majority of people to go through the winter months without some sign of cold in the chest. Acute bronchitis is a state of inflammation of the bronchial or lung tubes, often the outcome of neglecting a common cold. There is a state of fever, with wheezing and a painful, irritating cough. As the attack progresses, the cough becomes looser and sputum is coughed up more easily. This helps to clear the tubes and bring them back to normal. Bed, a warm but ventilated room, light diet, kaolin poultices and, in serious cases, inhalations from a steam kettle will be advised by the doctor. This increases the watery vapour in the air and makes the latter less irritating to the respiratory passages. It is better to have a kettle with a long spout if possible, and in order to concentrate the steam around the patient a tent should be rigged up over the bed consisting of sheets or blankets. Friar's balsam or any other volatile substance may be added to the water and distributed with the steam. The patient should inhale this steam only for a few minutes every hour.

BRONCHITIS, CHRONIC, may be treated in the same way as acute bronchitis, and great care must be exercised to avoid cold. The chest should be rubbed with a stimulating liniment and, if possible, the sufferer should live in a dry, warm climate.

BRONCHO-PNEUMONIA. — The majority of cases are secondary to bronchitis, influenza or after an attack of measles. It is also called catarrhal pneumonia because of the extension of the catarrhal infection into the lung tissue. The temperature may rise to 105° Fahr., and the pulse and breathing become rapid.

Treatment.—The room should be kept warm but well ventilated. A steam kettle may be kept going and the chest rubbed with a camphor liniment. A cold sponge will help to soothe the fevered patient. The diet should be light and nourishing. The patient needs nursing night and day. The sulphonilamide drugs are now available to shorten this disease.

BRUISES.—When the skin is bruised, the blood-vessels beneath the surface bleed and cause discoloration. Applications of ice or cold water fomentations may be made to tighten up the bleeding vessels.

BUBONIC PLAGUE.—Bubonic plague is so called because it is characterized by swellings or buboes of the lymphatic glands of the armpits and groins and other parts of the body. (*See* PLAGUE.)

BULBAR PARALYSIS.—When the highest part of the spinal cord and the medulla oblongata are diseased the nervous centres which govern the tongue, lips and larynx are affected. The patient may find it impossible to masticate food, and the results are very serious.

BUNION is an enlargement of the big toe joint due to deformity of the toe and to the abnormal pressure on the joint.

Treatment.—The pressure should be relieved by wearing a circular pad with a hole in the centre; and where there is inflammation hot fomentations should be applied. In painful, crippling cases, an operation may be advised.

BURNS AND SCALDS.—Burn is the term applied to injury from dry heat, and scald is injury from moist heat. Corrosive acids and alkalis also cause burns by their corrosive action on the tissues. There are various degrees of burns, some merely reddening the outer skin and others completely destroying a limb. In the case of a serious burn, the danger of death from shock is very great, and also the danger of septic

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

absorption, but this can be avoided by the use of antiseptics.

Treatment.—In severe cases the medical attendant should be called in immediately. The clothes should be gently removed, and those pieces adhering to the skin should be well soaked in oil. Care should be taken not to tear or break any of the blisters if possible, and the burn should be protected as soon as possible from the air by a sprinkling of bicarbonate of soda and covered with a pad of cotton wool. Any mild antiseptic may be applied. A weak solution of tannic acid gently sprayed on to the burn is an up-to-date treatment, while the application of gentian violet jelly is also most healing. A simple emergency burn outfit should be kept handy in every home.

BURSA.—This is a sac which forms over a bone where there is any pressure, such as the knee, elbow or heel. Undue friction may cause an increase of fluid, or even an abscess may form. A common example is "housemaid's knee." The treatment is to rest the affected part and, in the case of abscess, fomentations should be applied. A cushion or pad should be used to prevent friction.

CACHET.—A chemist's preparation consisting of two pieces of wafer which, when stuck together, will hold a small quantity of powder and will easily dissolve when swallowed.

CACHEXIA.—The wasted condition due to malnutrition in serious disease.

CAISSON DISEASE. — *See* DIVER'S PALSY.

CALCULUS.—A stone-like concretion found in various hollow organs of the body, such as the bladder, gall-bladder and kidney.

CALLOSITY.—A hard thickened patch on the skin, caused by friction, as on the hands or feet.

CALLUS.—New growth of bony tissue surrounding the join in a fractured bone.

CANCER. — A malignant tumour, or tumour whose growth threatens life. The two kinds of malignant tumour, carcinoma and sarcoma, are for general purposes classed together under the title cancer, the difference between them being one of the character of the cells of which they are composed. As the uterus (womb) and breast are very frequently attacked, it is obvious that women victims of cancer outnumber men. Other localities which are liable to cancer are the tongue, œsophagus, stomach, intestines, gall-bladder, liver, larynx and bones. The cause of cancer is still unknown; although it has long been observed that chronic irritation of a part may be followed by cancer in that part, it is not known why it should be. In 1925 Dr W. E. Gye and Mr. J. E. Barnard were able to photograph living organisms which they found present in cases of both sarcoma and carcinoma. Other workers, however, were unable to confirm their observations. Research into the causation of cancer is being carried on all the time by a great band of skilled medical research workers all over the world, working under such bodies as the Medical Research Council, the Cancer Research Fund and the British Empire Cancer Campaign, in the large hospitals and privately in their own laboratories. It would seem that it is only a question of time until the cause of cancer is known, and its prevention and cure by medical means may become comparatively simple. In the meantime, operation in the early stages is the only certain cure, and the success of the operation depends upon the earliness at which the patient comes for operation, and no patient should waste an unnecessary day after the condition has been diagnosed. Some authorities prefer treatment by X-rays or radium, as a means not only of slowing the growth of the disease and rendering the patient more comfortable, but actually for cure, though operation has most advocates. A great deal can be done nowadays in the matter of relieving the miseries of the cancer patient even when cure is impossible. In this connexion it may be mentioned that there is nowadays much discussion as to the possibility of rendering legal euthanasia or the artificially induced calm and easy death for people suffering from incurable disease. In the meantime the most important measure in connexion with cancer is undoubtedly the early recognition of the condition, and not only all middle-aged people but their doctors should be warned of the various possible symptoms.

CANCRUM ORIS.—Canker or gangrene of the mouth may develop after an attack of measles, typhoid fever or some other wasting disease; it usually occurs in young children. It is almost unknown in Great Britain now.

CANITIES.—Whitening of the hair.

CAPILLARIES.—Minute blood vessels.

CARBOHYDRATES. — A group of organic compounds comprising the starches, sugars and celluloses, and containing carbon, hydrogen and oxygen. Carbohydrates in food supply the body with muscular energy and maintain the body heat.

CARBOLIC-ACID POISONING.—The lips and mouth are burned and appear white and dry. An emetic may be given, but it is imperative to note that no oil should be administered, as the poison is very soluble in oily substances. The body must be kept warm and milk and white of egg may be given to sustain the patient.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CARBONIC-ACID SNOW, TREATMENT BY.—Carbonic-acid snow may be made from the condensed gas allowed to escape from a carbonic acid cylinder. This treatment has proved beneficial in cases of rodent ulcer or cancer of the skin, and also in the treatment of warts, moles and callosities.

CARBUNCLES.—*See* BOILS AND CARBUNCLES.

CARCINOMA.—(*See* CANCER.) A type of cancer which differs from sarcoma in the type of cell from which it arises.

CARIES, DENTAL.—Decay or rottenness of teeth. (*See* TEETH, DECAY OF.)

CARRIERS.—Typhoid fever, cholera, dysentery, diphtheria and cerebro-spinal fever may be spread by persons who, although they are not suffering from the disease, are harbouring some of the germs. Other "carriers" may have had the disease and have not got rid of all the germs. Their infectivity may last for a short period only or may go on for many years. Diphtheria carriers must have their tonsils removed.

CARTILAGE. — Gristle, a connective tissue between bones.

CARTILAGE, SEMILUNAR.—A cartilage which forms part of the knee-joint and is not infrequently dislocated or torn, causing difficulty in moving the knee and lameness. This condition may be very troublesome and may require an operation if rest and a suitable bandage or truss do not improve matters.

CATALEPSY.—The patient suddenly becomes dazed and may go off into a trance lasting a few minutes or days, the limbs remaining in the same position without any sign of fatigue. In most cases it occurs in hysterical people and is looked upon as a manifestation of hysteria. Treatment may be given in the form of cold douches.

CATAPHORESIS.—A method of treatment by which drugs are introduced into the system by means of solutions applied to the skin by electricity.

CATARACT.—This usually comes in old people, but it may be due to inflammation or diabetes. The lens of the eye becomes milky in appearance and the sight gradually disappears. The only treatment is operative removal of the opaque lens, which can be replaced by glasses later on.

CATARRH, NASAL.—The duty of any lining membrane is to secrete mucus. Any excessive increase of that secretion is known as catarrh. The nose and upper breathing passages are all lined with mucous membrane to act as a protective filter. Any irritating substance, such as pepper, can cause a temporary catarrh. The most common cause of nasal catarrh, however, is infection. This can be acute with complete subsidence as in the common cold. Chronic catarrh, however, may ensue; this means that the infection is not completely cured. The infection may be in the air sinuses of the cheek bones; it may be due to diseased adenoids or tonsils, or to an increase of the membrane itself, as in polypus. The bone of the nose may be bent, preventing proper drainage. Children should be taught to breathe correctly and to learn to blow their noses properly; these habits established early do much to prevent later trouble.

Treatment is always that of the cause, which can be determined only by a doctor. The stuffiness that follows a bad cold can be relieved by nasal drops such as menthol or ephedrine in liquid paraffin. This should not be continued indefinitely, and a nasal douche should never be used without proper advice, as this may only spread infection. It should not be sniffed up the nose but allowed to run through from a glass douche, or else syringed up by a rubber ball syringe. If the douche is sniffed up it may convey infections to other parts of the nose and even to the ears. A favourite douche is to take equal parts of bicarbonate of soda, borax and common salt and make them into a powder; a half-teaspoonful of this powder to a half-pint of warm water is douched up the nose once or twice a day. If simple methods do not clear up the nasal catarrh after carrying them out regularly for three or four weeks, the nose should be examined by a doctor.

CATHETER.—A hollow tube to be passed into the bladder for the purpose of withdrawing the urine.

CAUSTIC POTASH AND CAUSTIC SODA POISONING.—The treatment is the same as for ammonia.

CAUSTICS.—These are substances used to destroy diseased tissues, or for cauterizing wounds such as snake-bite or dog-bite. Among the many caustics used are several acids, such as carbolic, nitric, sulphuric, also silver nitrate, perchloride of mercury and chloride of antimony.

CELLULITIS.—This occurs mostly in connexion with wounds when the deeper tissues become infected. It is also present with a carbuncle. It causes great swelling, pain and fever. In severe cases of cellulitis several incisions may have to be made, and these should be given very careful dressing. Salpha drugs and penicillin are also employed.

CEREBELLAR ABSCESS.—Abscess of the cerebellum, a portion of the brain. (*See* BRAIN.)

CEREBELLUM.—*See* BRAIN.

CEREBRAL ABSCESS.—An abscess of the brain. (*See* BRAIN.)

CEREBRAL HÆMORRHAGE.—This is bleeding into or upon the surface of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

brain, which may cause unconsciousness, paralysis or death, depending on the amount of the bleeding and the part of the brain affected. The only treatment of much avail is absolute rest and treatment of the conditions which brought it about. No stimulant may be given. If the bleeding is not very extensive the patient may make complete recovery.

CEREBRO-SPINAL FEVER. — This disease is also known as cerebro-spinal meningitis; it means inflammation of the meninges or coverings of the brain or of the spinal cord. It is caused by a germ, the meningococcus, and is believed to be conveyed by the secretions of the nose and mouth. Onset is usually sudden, with severe shiverings, intense pain in the back of the head and in the back and thighs. The muscles of the neck stiffen, frequently contracting so that the head is forced backwards between the shoulder-blades. The patient becomes very sensitive to light, and twitchings and spasm occur in various muscles. The temperature is raised, but not usually to more than 102° F. In certain cases spots appear the second or third day, but this rash is due to little hæmorrhages under the skin—hence the name Spotted Fever. In some instances the infection is so virulent that death may take place in about twelve hours, but in other cases the disease becomes chronic and may last for months. The disease may have such serious sequels as blindness, deafness, mental impairment, facial paralysis or squint and this serious disease cannot be treated at home.

Treatment.—Isolation is necessary. Injections of serum into the spinal cord have shown some very good results, and withdrawal of cerebro-spinal fluid by puncture with hollow needle into the spinal meninges may be carried out. The patient should be kept in a darkened room and the head pains relieved by applications of ice. The diet should consist of milk foods and broths, and stimulants in the form of brandy or whisky may be given in small doses.

CEREBRO-SPINAL FLUID. — The fluid which bathes the brain and spinal cord and protects them. It is believed to be derived from the blood. It becomes infected in meningitis and it can be examined by withdrawing a small amount of the fluid by means of a needle passed into the spinal canal.

CEREBRUM.—The chief portion of the brain, filling the whole of the upper part of the skull.

CERVICAL GLANDS, INFLAMMATION OF.—*See* ADENITIS.

CERVIX.—The neck of the womb. It is liable to laceration at childbirth, and if the tear becomes infected it may give rise to pelvic inflammation.

CHAFING.—Intertrigo is the medical term for this condition. It occurs where two surfaces of skin come in contact with each other, more especially if the skin is moist. It occurs frequently between the thighs, armpits and below the breasts in stout women. The prevention and treatment consists in careful washing and thorough drying of the affected parts, then dusting over with powder such as fuller's earth or boracic powder. When drying the skin, dabbing with a soft towel will be found more soothing than rubbing.

CHANCRE.—The sore which is typical of syphilis.

CHAPPED HANDS AND LIPS.—This condition is usually exaggerated if the hands and lips have been moist and then exposed to cold. Care should be taken to see that the skin is thoroughly dried, and a little glycerine mixed with rose water rubbed in night and morning will help to prevent this painful condition.

CHEYNE STOKES' BREATHING.—A type of breathing in which the respiration increases in rapidity up to a certain point, then decreases gradually until it ceases temporarily. It is of grave import in certain heart and lung conditions.

CHICKEN-POX.—Varicella, or chicken-pox, is an infectious disease, very common in children and occurring only occasionally in adults. It is quite distinct from small-pox; vaccination for the one is no protection against the other. It occurs usually in epidemics, and is very contagious.

Symptoms.—Ten to fifteen days may elapse before the first signs of rash appear after the infection has taken its hold. The child may feel feverish for about one day. The rash consists of small red pimples which are generally most numerous on the face and trunk. These are exceedingly irritable. The spots become filled with clear liquid, which dries up and then forms scabs which drop off in a few days. Several crops of spots may appear over a period of about four days, and each will go through the same process as the original. The patient should not be allowed to scratch the spots, as this may damage the skin and leave disfiguring marks.

Treatment. — The patient should be isolated until all scabs have disappeared, but need not necessarily be confined to bed after the temperature has dropped. The food should be light, consisting of broths, milk puddings and jellies. The skin should be dusted with boracic powder or bathed with weak Dettol to prevent irritation.

CHILBLAINS.—Chilblains are found in people with poor circulation and those who habitually suffer from cold hands and feet.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The blains appear most frequently on the hands and feet, but they sometimes occur on the ears and nose. They have the appearance of shiny bright patches on skin, and usually there is a good deal of itching and burning sensation. These patches may blister and break, causing an ulcerated surface which is very troublesome to heal.

Treatment.—Persons who are poor in health should nourish themselves and wear warm clothing over the hands and feet. Cod-liver oil should be taken as a preventative and calcium helps in many cases. Applications of iodine help the irritation. If the skin breaks antiseptic dressing is necessary. If ulcers form, boracic ointment should be spread on a piece of lint and laid over the part. Electrical treatment has sometimes proved beneficial in this complaint.

CHILDBED FEVER.—*See* PUERPERAL FEVER.

CHILDBIRTH. — The normal physiological process which follows conception. Pregnancy lasts for about forty weeks or nine calendar months. The expected date of the baby's birth is calculated as follows: take the first day of the last period, add five days, and subtract three months. For example, suppose the last period began on January 1; adding five days would give us January 6, and subtracting three months would give us October 6. This date is only approximate, and the baby may be born a few days earlier or, in certain cases, a few months earlier.

As soon as a woman suspects she is pregnant she should consult her own doctor or go to a welfare clinic, where her suspicions will be confirmed or otherwise by means of special tests. In one of these tests a fraction of the deposit from the woman's urine is injected into a test animal. By examination of the animal at certain known intervals it can be ascertained whether or not the woman is pregnant. Another type of test is dependent on the woman's temperature, which should rise about the time of ovulation (i.e. the fourteenth day of a normal twenty-eight day cycle) and fall at the onset of the next period. If the period fails to come and the temperature remains at the higher level, it is reasonable to suppose that she has conceived.

It is wise to make arrangements for a confinement well in advance, and visits to the doctor or clinic should be made regularly during pregnancy so that any abnormality can be detected early and complications can thus be avoided, or at any rate mitigated. When the child is ready to be born the neck of the womb, then the vagina and lastly the vulva have to stretch until there is one wide passage. During this time the muscles of the womb contract, firstly to drive the child lower into the mother's pelvis and later to express the child out of the stretched passage. Each contraction causes pain, and so in most cases the onset of pain means the onset of labour. The duration of labour varies considerably, but with a first baby it should be about twenty-four hours, and only towards the end are the pains intense. The knowledge that birth is travail makes some mothers-to-be fearful, but with no other pain is the reward so great and with no other pain is the necessary strength to bear it imparted. Birth pains can in part be relieved by drugs, by injections, as in "twilight sleep," by inhalation of chloroform and, more recently, by an appliance for breathing in gas and air which the patient can manipulate herself if the pain becomes too severe. The birth of the child is followed by that of the placenta or afterbirth, and then the baby starts its own individual existence. The period of "lying-in" follows to allow the womb to return to normal and for the breasts to secrete milk for the infant. This, in normal cases, should be from seven to ten days.

CHILD-CROWING.—This is a popular term for an affection due to spasm of the vocal cords, limited usually to children between the ages of one and four. It is nearly always associated with rickets and there is never any temperature during the attack. The spasm usually comes on very suddenly, the child becoming very distressed and unable to get its breath. A crowing noise is made every time the child attempts to draw a breath, respiration may temporarily cease, but after a short period a deep breath is taken and the attack is over. In some cases the crowing may go on for a few days. There is a great tendency to recurrence, and in weakly children there is a danger of death from suffocation.

Treatment.—The child should be placed in a hot bath and the skin stimulated by rubbing, and an emetic administered. A nerve sedative may be given. To prevent recurrence of spasm, the child should not be allowed to sleep in an unheated room.

CHILDREN, FEEDING OF. — *See* INFANT FEEDING.

CHILDREN, HYGIENE OF.—Cleanliness should be one of the main factors in the care of young children, and training with this in view is most essential. A warm bath or good wash should be given in the evening, as it is better for the child to go to sleep fresh and clean after the day's exercise. They should be taught to clean their teeth, blow their noses, and go regularly to the lavatory. They should be regular in their habits and go to bed early.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Some open air exercise is needed daily. Children should have as much sleep as they want, and the room should be well ventilated but not draughty.

CHIN-WHELK.—*See* BARBER'S ITCH.

CHLORAL POISONING. — Chloral may be taken as a sedative, but serious symptoms arise on the taking of too large a dose, or on the repeated taking of small doses.

The patient will become cold and clammy and the breathing may fail. An emetic should be given at once, and every effort made to rouse the patient by flicking his face with cold water or by any other means that suggests itself. Warm blankets and hot-water bottles should be placed over him and stimulants such as brandy or strong coffee administered by mouth if he is conscious, and by rectum if unconscious. If the breathing begins to fail, artificial respiration should be given.

CHLOROFORM POISONING. — An emetic must be given and every means taken to keep the patient awake. Treatment may be carried out as in chloral poisoning.

CHLOROSIS.—A form of anæmia common in young girls. Sometimes called the "green sickness" from the tint of the skin. (*See* ANÆMIA.)

CHOKING.—This is usually due to liquid or some other foreign body (food, or even a tooth-plate) getting into the larynx or windpipe from the pharynx instead of the gullet. An adult may be struck on the back to try to relieve the choking, or a child turned upside down; if this is not enough to relieve the trouble, a doctor should be sent for at once. (*See* FOREIGN BODIES.)

CHOLERA.—Cholera is one of the great epidemic menaces of the world, but fortunately it has not been allowed to flourish in Great Britain. In India especially, where the people are herded together in millions and sanitary arrangements are not particularly effective, this dread disease has been endemic for centuries. It is due to a germ called the comma bacillus, which was discovered by Koch in 1883. Infection is spread through the medium of drinking-water.

Symptoms.—An attack usually begins with diarrhœa, more or less violent in character, the material passed being of a semi-solid nature which later develops into what is known as "rice-water stools." The stomach and lower limbs are seized with agonizing cramps, and vomiting and headache usually follow the diarrhœa. In a few hours the patient may be so exhausted as to cease to feel any pain. The skin turns a bluish colour and has a shrivelled appearance; cold sweat appears on the surface of the skin though the internal temperature may be high. The urine secretion is suppressed. The next stage is the reactionary one in which the skin becomes warmer, secretion of urine commences, and vomiting and diarrhœa cease.

The patient is by no means out of danger as there is considerable risk of relapses or of complications setting in. It must be understood that the severity of the symptoms varies a good deal in accordance with the virulence of the epidemic. In some cases death may occur a few hours after infection, while in others nothing more may be felt than a very severe diarrhœa.

Treatment.—The first aim should be to try to diminish the diarrhœa and to relieve the cramping pains. The patient should be covered by warm blankets, and hot-water bottles placed at the feet and thighs. To relieve the patient's thirst, iced champagne or weak brandy and water may be given. During convalescence no solid food should be administered, the diet consisting chiefly of broths, barley-water and diluted milk. Injections of a saline solution into the veins or beneath the skin should be tried in cases where there are signs of heart failure. It is most important that all clothes removed from a patient should be either burned or disinfected by boiling, and owing to the high infectivity of the stools, these should be burned immediately or disinfected with strong carbolic acid. Vaccination against cholera is now being carried out extensively, the protection usually lasting about a year.

CHOREA.—*See* ST. VITUS'S DANCE.

CIRCULATION OF THE BLOOD.—The purpose of the circulation of the blood is to convey nourishment to all parts of the body; the nourishment consists partly of oxygen (derived from the air in the lungs) and partly of food substances (derived by absorption from the intestine). After nourishing the tissues of the body, the blood returns laden with impurities, which are got rid of by the kidneys (urine) and the lungs (carbon dioxide). The circulation of the blood is brought about by the muscular heart pumping the blood into the arteries, then through the small blood-vessels called capillaries, and then it returns to the heart in the veins. When the venous blood comes back to the heart it goes through the lungs, where it gives off carbon dioxide and takes up oxygen. There is a secondary circulation called the portal circulation, in which the venous blood from the stomach and intestines and from the spleen goes through the large portal vein to the liver, where it undergoes certain modifications before coming back to the heart.

CIRCUMCISION consists in the cutting off of the foreskin of the penis. This is quite a simple affair in baby boys, without

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

any danger attaching to it, and is practised as a religious rite by Jews and Mohammedans. Among other people circumcision is usually done as a hygienic measure.

CIRRHOSIS OF THE LIVER.—This often goes under the names of "gin-drinker's liver" and "hob-nailed liver"—in the former case from the belief that it is caused from the consumption of too much alcohol, and in the latter because the liver shrinks and presents a hard, knobby surface. The theory that excessive alcohol produces cirrhosis of the liver has been modified. A few cases of this disease have been found to be a sequel to scarlet fever or some other infectious disease, or an aftermath of malaria or syphilis. Those suffering from degeneration of the liver are often heavy drinkers; but on the other hand all heavy drinkers do not develop cirrhosis of the liver. It is caused by degeneration of the liver because of great increase in the fibrous tissue followed by large deposits of fat. The fibrous tissue brings about a hardening and contraction so that the shape and appearance of the liver are altered and its function gravely impaired. In the liver the food we eat is broken down into simpler substances, which the organs and tissues use to keep us healthy. Through the liver also the blood from the intestinal organs passes on its way back to the heart.

Symptoms are (1) faulty liver function, seen in biliousness, headache, depression, lassitude and, finally, coma; and (2) obstructive constipation, gastric hæmorrhage, piles, dropsy. This extremely low state also makes the patient very liable to other diseases, such as tuberculosis or pneumonia. The patient sleeps badly, and very often looks thin and slightly yellow complexioned. The urine becomes scanty and turbid. Ascites, or dropsy of the peritoneal cavity, with distension of the stomach and enlargement of the legs, are very often present.

Treatment.—Only the lightest of food should be taken and meat should only be eaten in the form of chicken. Fish, milk puddings and milk soups should furnish the greater part of the meals. The bowels should be kept open, and the taking of bicarbonate of soda in warm water may help to dispel the feeling of nausea. Naturally treatment lies merely along the lines of relieving the symptoms, as once the liver becomes cirrhotic, nothing can be done to bring it back to its original state. Alcohol must be abstained from and the patient should take as much exercise as possible. For the treatment of dropsy see the paragraph on that subject.

CLAUDICATION.—Lameness. Intermittent claudication, in which there is intense pain in one or both legs on walking but none when at rest, is often an accompaniment of arterio-sclerosis.

CLAUSTROPHOBIA.—Fear of being in a confined space such as a room with the door shut, or in a crowd.

CLAVUS HYSTERICUS.—A pain in the head, as if a nail were being driven into it.

CLEFT PALATE.—This is due to the two sides of the roof of the mouth not joining together properly, with the result that a gap is left. If allowed to go untreated it causes great difficulty in feeding and also causes a defect in speech. In some cases the gap is too wide to be closed by operation, but a specially prepared dental plate should be worn. Operation should be performed in early childhood, preferably during the first three months.

CLITORIS.—The clitoris is the most sensitive part of the external female genital organs; it is interesting as representing the penis of the male and, like it, is composed of erectile tissue, which fills with blood.

CLUB-FOOT (TALIPES).—This is a deformity which may be present at birth or may arise in various ways in later life. Infantile paralysis is a very common cause of this condition. In congenital cases it may be due to pressure in the womb or to faulty position of the child.

Treatment.—The treatment of club-foot demands a great deal of care and patience. In slight cases manipulation can be started a few days after birth for a few minutes night and morning, of course always under medical supervision. More severe cases, however, will require splints and some form of supporting apparatus. If the deformity has not been corrected by the time the child has reached the age of five or six, operation may be the only treatment.

CLUB-HAND.—This condition is much more rare than club-foot and it is always congenital. It may be due to a cramped position in the womb, or there may be complete absence of one of the bones of the forearm. Cases in the first group may be cured by manipulations; but in the cases where there is absence of bone, the tendons should be cut and an apparatus worn.

COCAINE.—Used as a local anæsthetic. It is a dangerous drug to use on account of the ease with which a habit is formed, and when the habit of taking cocaine is formed the moral and physical degeneration is even more rapid and hopeless than with morphia.

COCCYGODYNIA.—Pain felt in the region of the coccyx, the last bone in the vertebral column. This occurs chiefly in women who have had children.

CŒLIAC DISEASE.—A condition in children when they are unable to digest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fats. The appetite is very poor and the stools are large, evil smelling and like porridge.

COLD.—For the common cold *see* CATARRH, NASAL.

COLIC.—By colic is meant severe pain in the abdomen; it is commonly known as "stomach ache." Simple colic is due to violent spasms of the muscular tissues of the intestines, brought on by the presence of some irritating or indigestible substance in the bowel. Colic is also one of the features of chronic lead poisoning; the form of the disease which attacks painters is known as painter's colic. It may also be brought on by chill, nervous disturbance, or through mental fatigue.

Symptoms.—The pain varies a good deal from a slight ache to an almost unbearable spasm which may be felt all over the abdomen, but usually it is more concentrated in the region of the navel. In bad cases the patient's face becomes pinched with pain and a cold sweat may break out all over the skin. The body may be doubled up or the legs may be drawn up, and the patient is usually found clutching the abdomen. In some cases there is considerable distension of the stomach from wind. The attack may be of very short duration; as a rule, the more severe the attack the shorter its duration. It must be borne in mind that colic pains also appear in many other more serious diseases, such as stone in the kidney or gall bladder, and if there are any indications that the pains are due to more than simple colic the doctor should be called in at once.

Treatment.—The patient should be put to bed and hot-water bottles placed near the feet and abdomen. The stomach should be gently massaged, as this very often helps to free the gas from the intestines. An enema should be given to clear out the bowels, and followed by a dose of castor oil. Young children frequently have colic, usually due to unsuitable food. The infant should be laid over the knee, face downward, and the back gently rubbed. The pain may be relieved immediately by an enema of hot water slowly injected into the bowel. If the milk is too rich for the child, it should be diluted with some barley water, or two or three tablespoonfuls given before feeding.

COLITIS may be due to unsuitable food (as is frequently the case in children), to infection (such as dysentery or sprue), to various toxic substances (such as those produced in the decomposition of milk and other articles of food), to changes in the intestinal secretions or to nervous influences. From its cause it is either acute or chronic. *Chronic colitis* is most frequently of nervous origin and can be characterized by the passage of quantities of mucus—hence the name "mucous colitis." In its more severe form blood may be passed—"ulcerative colitis." These must be treated by a doctor. The diet must be non-irritating, while medicines to coat the bowel, such as bismuth, must be taken, and in the more intractable cases wash-outs or irrigations may be found necessary.

COLLAPSE. — Extreme prostration resulting from failure of the circulation due to shock, hæmorrhage, rapid wasting, etc. Warmth and hot drinks should be given. (*See* SHOCK.)

COLLES'S FRACTURE.—Fracture of the lower end of the radius, near the wrist. (*See also* FRACTURES.)

COLON.—The large intestine is called by various names in different parts. It begins at the cæcum, into which the small intestine opens, on the right side of the abdomen; then the ascending colon, up to the liver; the transverse colon goes right across the abdomen; the descending colon begins at the spleen and goes down the left side of the abdomen. The iliac colon is a short piece which curves into the pelvis; and the rectum is the dilated last part of the large intestine, ending on the surface at the anus.

COLONIC IRRIGATION.—A method of treatment used in mucous colitis, ulcerative colitis and other diseases. A rubber tube is passed up into the bowel, which is washed out by one or two pints of warm saline or other simple lotion.

COLOUR-BLINDNESS. — This is a defect which is congenital in the majority of cases. The colours most frequently confused are green and red, but quite a few people have minor colour-blindness without being aware of it. The condition is incurable, but the eyes are otherwise normal.

COMA.—This is another name for unconsciousness. It may be produced by a variety of conditions, such as apoplexy, brain disease, sunstroke or poisoning either from faulty functions of the body, such as in Bright's disease or cirrhosis of the liver, or from the swallowing of narcotics, or even from exposure to extreme cold. There are various degrees of coma, but deep coma, which persists for longer than twenty-four hours, usually ends in death.

COMPLEXION.—The state of a person's health is often indicated by the complexion. Mitral disease of the heart, for instance, usually produces a bright red patch on each cheek; a mottled blueness, particularly noticeable near the lips, is often indicative of chronic heart or chest troubles. Disorders of the digestive system frequently give rise to pimples and rashes on the face. Simple anæmia brings about a greenish pallor, while pernicious anæmia is signi-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fied, as a rule, by the pale-lemon pallor it produces in the face. Tuberculosis and other chronic fevers give rise to a comparatively hectic flush in the face around the cheek bones.

COMPRESSES.—A compress is a means of applying moisture to an inflamed part. The material used may consist of lint or linen, and the water may be cold, warm or hot. The material should be wetted and then wrung out, placed over the wound and covered with a piece of oil-silk and the whole kept in place by a bandage.

CONCUSSION OF THE BRAIN.—*See* BRAIN, CONCUSSION OF.

CONGENITAL DISEASE. — Disease which has been present from birth.

CONGESTION OF THE LIVER.—The liver becomes very enlarged and congested with blood, usually the result of over-indulgence in rich foods and alcohol, but it may also be due to diseases of the circulation. In many cases the patient suffers from piles, and by the bleeding from these the congested liver condition may be relieved. The bowels should be kept clear by means of a grain of calomel taken at night and a dose of salts in the morning. All alcohol should be avoided and the diet should be very light and simple.

CONGESTION OF THE LUNGS.—The condition when there is an extra supply of blood in the lungs which is not circulating as freely as is normal. There are two distinct types: (1) inflammatory, and (2) static. The inflammatory condition is associated with acute disease of the lungs, as bronchitis or pneumonia. The static is due to impaired circulation, as in old age, debility, exhaustion, or due to restricted blood flow as in chronic heart disease, cirrhosis of the liver or Bright's disease. In illnesses where the patient has to be kept in one position for a lengthy period, as in treatment of fractures and operations, the condition calls for careful nursing. The patient should be propped up in bed, the position altered where possible and the bowels kept well open. Naturally, treatment of the cause is the first consideration.

CONJUNCTIVITIS. — The membrane lining the inner surfaces of the eyelids and the front part of the eyeball becomes inflamed. It may be due to exposure to cold, irritation by a foreign body, germ infection or eyestrain. There are several forms of conjunctivitis; catarrhal conjunctivitis may be caused by glare from strong lights or snow, foreign bodies or irritating gases. The discharge may be watery or become purulent according to the severity of the condition. If purulent, the discharge may collect during the night and cause the lids to stick together. The eyes become bloodshot and painful and there is a dislike of bright lights. In young children the condition is one of debility. The dangerous condition in new-born babies resulting from gonorrhœa, and the cause of so much blindness, is not very prevalent nowadays. In all of these forms the eyes water profusely and become very bloodshot. The sight does not become affected.

Treatment.—If the inflammation is due to a foreign body, it must be removed and castor oil dropped in, or the eye bathed with boracic acid lotion. The eyelids may be prevented from sticking together at night by applying a little vaseline or boracic ointment along the lids before going to bed. In children cod-liver oil is needed. As most forms of conjunctivitis are contagious, great care should be taken to keep everything clean, and towels, etc., used by the patient should be kept apart from others.

CONSTIPATION.—A condition in which the bowels do not move easily or often enough. In most people one or two evacuations a day are required for perfect comfort. The predisposing causes of constipation are numerous. It may be a family complaint, sedentary habits in people who eat too much or neglect the calls of nature, certain diseases such as anæmia, neurasthenia and hysteria, chronic disease of the liver, stomach and intestines, and fevers. The diet may be at fault either by providing a too large residue of irritating matter (roughage) or not enough to give the fæces sufficient bulk; or there may not be enough liquid taken to soften the bowel contents. Apart from constitutional causes there may be local causes in the bowel itself such as muscular atony or weakness, kinks in the bowel and bands constricting it. Visceroptosis, or falling bowel, is a frequent cause of very obstinate constipation. Drug-taking and the prolonged and injudicious use of aperients also render the constipation more intractable.

In some persons constipation may exist with good health, but in general the condition causes a considerable amount of discomfort and may lead to more serious ill-health. There is no proof, however, that it leads to cancer, as has been asserted. Debility, dizziness and depression, headache, loss of appetite, furred tongue, foul breath, gastric trouble, are the usual symptoms of constipation. The complexion may become sallow and pimply, and in girls the monthly period may be rendered painful.

Treatment.—The patient should form a regular habit by going to the stool every day at the same time, whether there is a "call" or not, and the call should never be neglected. Massage of the abdomen and exercises help many obstinate cases. The diet should be regulated until a suitable

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

routine is found. Proteins should be reduced, and vegetables and fruit taken in abundance. Water and aerated waters may be taken freely, especially in the mornings on awaking and the last thing at night. If these measures do not improve the condition recourse may be had to mild laxatives, a list of which is given under APERIENTS.

CONSUMPTION. — *See* TUBERCULOSIS.

CONTAGIOUS DISEASES.—Diseases which are contracted by direct contact or intermediary contact with an infected person, as, for example, syphilis.

CONTRACTED FINGERS. — *See* FINGERS, CONTRACTED.

CONTUSIONS.—Bruises, or injury, inflicted without the skin being broken.

CONVULSIONS.—Fits, or convulsions, occur chiefly in young children. They sometimes come on without any warning, but in some cases warning is given by facial contortions or rolling of the eyes. The fit may last only a few minutes or it may be much more prolonged. In children of poor physique, slight disorders of digestion will sometimes cause convulsions, especially at the teething period. This condition is not a disease in itself, but may be the manifestation of one.

Treatment.—All tight clothing should be removed from the child and a warm bath prepared and the child placed in; meanwhile the doctor should be sent for. The child should then be put to bed in a well-ventilated room and encouraged to sleep. If the bowels require attention, an injection of soap and water should be given. Castor oil may be given, and the diet should receive attention. If teething is the cause of the trouble, the gums should be gently massaged with a soothing substance, and bicarbonate of soda given internally.

CORNS.—A corn is a thickening of the skin due to pressure of the shoe. There is an ingrowth in the centre, which distinguishes the corn from the ordinary callus. Hard corns generally appear on the outside of the toes or on the sole of the foot. Soft corns are of a spongy appearance and are to be met with between the toes.

Treatment. — All pressure from shoes should be avoided by the use of ring-shaped corn plasters. The feet must be kept clean and dry, especially in the case of soft corns. The feet should be soaked in hot water and the hard skin pared away with a clean knife or razor blade. The part should then be painted over with salicylic collodion; this should be repeated about four times. Prevention, however, is better than cure, and ill-fitting boots or shoes should always be avoided, while the corn should be treated in the early stages as soon as its presence makes itself felt.

CORPUSCLE.—A blood cell. In the blood are red blood corpuscles, circular in shape and containing hæmoglobin, a red colouring matter, and white blood corpuscles. The function of the white blood corpuscles is to protect the body by destroying invading bacteria; in inflammation, therefore, the number of white blood corpuscles is increased.

CORROSIVE POISONS.—*See* POISONS AND POISONING.

CORYZA.—The common cold in the head. (*See also* CATARRH, NASAL.)

COUGH.—A sudden explosion of air forced from the throat after inspiration. The character of the cough varies according to the cause. It may be dry and without expectoration, or moist with expectoration. The pleuritic or sharp, dry, and frequent cough may denote the presence of pleurisy, pneumonia or phthisis. The cough in bronchitis is a means of clearing the passage of the collected phlegm. In other conditions a cough can be purely "nervous."

COUNTER-IRRITATION.—Any method of treatment by which local irritation is produced to draw blood to the surface, in order to increase the circulation to nearby tissues.

COW-POX.—A contagious eruption with fever which occurs in cows and may correspond to small-pox in man.

CRAMP.—Cramp is a painful muscular spasm which may affect any muscle, but those most often attacked are the muscles of the legs and feet. The attack may be due to lying in a strained or uncomfortable position for any length of time. As a rule the cramp passes off quickly. Exposure to cold, general weakness, fatigue or gout are a few conditions associated with cramp. The best way to relieve the pain during an attack is to stretch the affected limb. This may be very difficult and extremely painful, but it is well worth the effort. If the patient is unable to do this the affected part should be rubbed energetically until the spasm gives way. Cases of drowning from cramp are usually due to heart failure.

CRETINISM.—This condition is due to an absence of the thyroid gland in the neck or a failure of the gland to function properly. Cretinism may not be detected until the child is about a year old; then the parents notice that the child is gaining very slowly in stature, activity and intelligence. Cretins are ugly and dwarfed; their mentality does not develop and they remain unclean in their habits.

Treatment.—This consists chiefly in the administration of thyroid gland extract, which should be continued all through the patient's life. If the treatment is begun early enough, development may proceed in a perfectly normal manner.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CROUP.—A disease of the larynx and trachea most common in small children. It begins with fever, running nose and coughing, followed by a peculiar difficulty in breathing. There is often a tough membraneous catarrh of the larynx or voice box. The cough is very characteristic. In a severe form the child's life may be in danger from exhaustion. A doctor should be sent for to treat the croup as there is a danger of the child's choking, and a tracheotomy may have to be done.

A slight catarrh of the larynx accompanied by noisy cough, and called false croup, may occur in small children who have rickets, adenoids or enlarged tonsils. This form is troublesome only at night. Ipecacuanha is given as an emetic to cause free expectoration and ease the breathing. Heat compresses may be applied to the throat, or in the case of older children a mustard plaster or iodine.

CUT THROAT.—When suicide is attempted by cutting the throat it is usually the left side of the throat that is cut (by the right hand), and the carotid artery may be severed. This is a very serious matter and may cause death in a few seconds; bleeding can be stopped usually only by direct pressure with the thumb into the wound, pressing the artery towards the spinal column and at the same time pressing the fingers of the hand into the neck behind. This is done temporarily until a doctor arrives, but is very tiring to the hand. Sometimes the windpipe is severed, but this is not so urgent, as the patient can breathe through the cut.

CYANOSIS.—If the heart fails to function normally and causes an imperfect flow of blood through the lungs, the lungs in consequence will receive an insufficient supply of oxygen. The blood, instead of retaining the red colour characteristic of arterial blood, will turn a more bluey colour and the surface of the body will develop the same hue—hence the common term, "the blue disease." The symptoms may be lessened by the inhalation of oxygen, the supply of this necessary element being thus artificially replaced.

CYSTITIS, or inflammation of the bladder, is due to infection by germs, or may be due to exposure to cold and wet. The main symptom is an urgent need to pass water at frequent intervals, which is accompanied by hot, burning pain. The patient must be kept warm in bed and the kidneys flushed out with plenty of barley-water. The diet should be light, consisting mostly of milk. The modern treatment is by sulphonamides or penicillin.

CYSTS result from the dilation of pre-existing tubules or cavities, and thence tumours or swellings are formed, filled with fluid or semi-solid substance. There are many varieties. Some form in organs of the body such as the breast, ovary, prostate, kidney and thyroid glands; others are accumulations of normal fluid, as in hydrocele or bursæ around joints. Another variety (of great interest to surgeons) are the dermoid cysts, errors in development which occur very early in fœtal life. Inside these dermoid cysts are found hair, teeth and fragments of bone. Hydatid cysts are parasitic; they are due to worms which inhabit the intestines of dogs (especially in Australia and Iceland), and whose fæces contaminate food and water consumed by man. Possibly the commonest form of cyst is the sebaceous cyst, or wen, which forms when the ducts of the lubricating glands of the skin become blocked. They occur anywhere on the skin, but are most common on the scalp and neck, sometimes reaching the size of a small orange. They are not harmful, but can be a nuisance. The treatment is surgical.

DANDRUFF (Pityriasis).—A condition of scurfiness and scaliness of the scalp. It is the most frequent cause of early baldness.

Treatment.—Attend to the general health, keep the head clean by daily shampooing, and use the same brush and comb, which should be frequently washed. A lotion may be rubbed in. The inside of the hat should be frequently disinfected with spirits. Dandruff is very frequently present on the scalps of newly born babies, but care will remove it in a few days. It will be noticed that members of the hatless brigade very seldom have dandruff and early baldness.

DEAF-MUTISM. — A child who has become deaf before learning to speak remains dumb as well and is called a deaf-mute. Such unfortunate children should be sent to an institution or school for deaf-mutes, where they will be taught to read and write and talk as well as to lip-read.

DEAFNESS.—Deafness may be due to (1) an affection of the outer ear or passage leading to the ear drum, (2) an affection of the middle ear, behind the drum, or (3) of the internal ear, nerve deafness. Among the first group the commonest is wax in the ear, which is usually easily removed by syringeing with a warm lotion (*see* EAR, DISEASES OF). In the second group deafness may be due to obstruction of the eustachian tube, which leads from the throat to the ear, or to chronic suppuration or chronic catarrh in the middle ear: otosclerosis, another cause of deafness in this group, is due to changes in the bone surrounding the inner ear, sometimes immobilizing the stapes, the third of the little ossicles which stretch across the middle ear. In the third group the deafness may be due to disease of the cochlea, the organ of hearing, or to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

disease of the nerve of hearing; the commonest causes of this type of deafness are poisoning from quinine or tobacco, and syphilis. The *treatment* of deafness depends on the cause. Obstruction of the eustachian tube is treated by inflation with the eustachian catheter.

Suppuration of the middle ear must be cleared up, when present, before the resulting deafness lessens. Chronic catarrhal deafness is difficult to cure, and probably regular eustachian inflation is the best treatment. The cause of otosclerosis is not yet definitely known; the best thing to do is to look after the general health and avoid worrying. For nerve deafness the various causes must obviously be given the appropriate treatment.

DEFICIENCY DISEASES. — Diseases which are caused by a deficiency of one or more of the elements in food which are necessary to the maintenance of the body in good health. The elements most usually deficient in the diet in town life are vitamins. Beriberi, rickets, scurvy, etc., are deficiency diseases.

DEFORMITIES.—*See* MALFORMATIONS, CONGENITAL.

DELIRIUM.—A condition of mental excitement with confusion and sometimes delusions. It is not a disease but a symptom set up by disorder in the brain, or toxins in the blood. Some drugs cause it, such as opium. The delirious patient should not be left alone.

DELIRIUM TREMENS.—*See* ALCOHOLISM, ACUTE.

DELUSIONS.—A false belief, whose falsity is apparent to everyone but the holder of it, who cannot be made to see reason. Delusions are a symptom of insanity, or at least of a psychasthenic state. (*See* INSANITY.)

DEMENTIA.—A form of insanity which is characterized by deterioration and loss of the intellectual faculties, the reasoning power and the memory. (*See* INSANITY.)

DEMENTIA PRÆCOX.—A form of dementia which comes on at the age of puberty in young persons who have been previously intellectually bright. It usually develops quickly to complete dementia.

DENGUE.—An acute infectious fever found in the tropics. It is characterized by fever, severe pains in the bones and joints and a skin eruption. Convalescence is slow but recurrences are rare.

DENTAL CARIES.—*See* TEETH, DECAY OF.

DENTITION.—*See* TEETHING AND ITS TROUBLES.

DERBYSHIRE NECK. — A popular name for goitre, which is common in Derbyshire and other mountainous regions.

DERMOID CYSTS.—A cyst containing elements of the skin, such as hair, teeth, etc., due to defect of development.

DHOBIE'S ITCH.—An itching, ringworm-like disease found in the East and called after the dhobie or washerman, the common belief being that the infection is contracted from clothes which have been to the washerman.

DIABETES INSIPIDUS.—A disease characterized by the passage of very large quantities of urine (sometimes forty or fifty pints in a day), normal except that it is very dilute. It is most common in young people under twenty and more in youths than in young women, frequently coming on after a shock or a fright. The cause is now known to be a defect of the pituitary gland situated under the base of the brain. The most successful treatment has been the injection of pituitary extract, but thymoid extract has also been used with success.

DIABETES MELLITUS.—A disease in which the chief characteristic is the presence of an increased amount of sugar in the blood and in the urine. It is due to inability of the body to break down and use the starches and sugars in the food. The first symptom is usually an increased desire to pass urine or an undue thirst. The presence of sugar in the urine is easily found out by a simple chemical test (with Fehling's solution) and not infrequently the first intimation that a person has diabetes comes in the course of a life insurance examination. Boils and carbuncles are very common in diabetes, and a person who has persistent boils should always have his urine examined. Perforating ulcer of the foot and gangrene are other troublesome complications that are not uncommon. As regards *treatment*, the outlook in diabetes has been transformed by the isolation of insulin (by Drs. Banting and Best, in Toronto), but diet is still as important as ever. Insulin is not a cure for diabetes, but the disease may be held in check by careful daily injections of insulin.

In mild cases a simple dietary is sufficient, but in more severe cases the dietary rules must be rigid. The chief restrictions in the diet are as regards the carbohydrates (starches and sugars), but nowadays these are not usually cut out completely—the amount of carbohydrate the patient can tolerate without harm is ascertained. The outlook is much better when the patient takes an intelligent interest in his case and sticks to the rules he is given; he will have to learn to weigh his food and test his urine daily and lead a quiet life, without excitement or worry.

DIAGNOSIS.—The process by which the physician discovers the cause of a disease. The temperature is taken at regular intervals and recorded with the pulse rate and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

breathing rate on a chart. The abdomen is *palpated*, that is, manipulated and felt with the hand in order to discover its underlying condition. The chest is percussed and listened to with a stethoscope (auscultation). Discharges from the body and specimens of secretions are examined microscopically for bacteria and abnormalities, and photographs of the suspected parts are taken by X-rays. The barium meal reveals the working of the whole digestive tract. A quantity of gruel made with barium is swallowed and the patient is photographed at intervals for the next twenty-four hours, so that the whole progress of the barium from the œsophagus to the rectum may be noted. Any obstructions in its path, or variations from the normal in the rate it travels, will be noted. Photographs can now also be taken of other organs of the body, so that in any well-equipped hospital a complete picture of the workings of the patient's organism can be obtained. It should be remembered, however, that the human organism is so complicated that a disorder of one part throws the others out of gear and the underlying cause of an illness may be very difficult to determine.

DIARRHŒA.—The condition where the bowels move too frequently and the motions are of too soft a consistency. It is not a disease in itself, but rather a symptom of various diseases, or may be brought on simply by the abuse of aperients or the eating of too much fruit. Damp and cold will bring on diarrhœa in some people, and various nervous conditions may be responsible for an attack. The effect of fright or sudden sorrow in this respect is well known. The most frequent cause, however, is the eating of some tainted or unsuitable article of food. A simple isolated attack of diarrhœa is easily treated. A large dose of castor oil should be taken and, when the bowels have been thoroughly purged, a chalk or bismuth mixture may be taken to clear up the diarrhœa, and cornflour and arrowroot puddings may be added to the diet. If there is much pain or exhaustion, a doctor may prescribe opium. For diseases of which diarrhœa is a symptom, *see* CHOLERA; COLITIS; DYSENTRY; ENTERITIS; INFLUENZA; TYPHOID FEVER.

DIATHERMY.—*See* ELECTRICAL TREATMENT.

DIATHESIS.—A physical condition or tendency which renders an individual particularly liable to contract some one disease, as for example gout, tuberculosis, asthma, etc.

DICK TEST.—*See* SCARLET FEVER.

DIGESTION.—The united processes by which food eaten is prepared for assimilation into the blood and tissues of the body. The process of digestion takes place in stages as the food passes down the alimentary canal from the œsophagus to the rectum. In the mouth the food is divided into fragments and is moistened with saliva, which begins the digestion of the carbohydrates or starchy food. Passing through the pharynx and gullet the food reaches the stomach, where it is met by the gastric juice which should contain pepsin, hydrochloric acid and rennin. The movements of the stomach mix it thoroughly with the gastric juice, and further break it up. Certain chemical constituents, such as salts and sugars, are absorbed by the stomach, but the mass of the meal passes by way of the pylorus into the duodenum, where it meets secretions from the pancreas and liver as well as those produced by the small intestine itself. Here almost all the absorbable material is ready for absorption, and is removed by various means to the parts of the body where it is dealt with further. The remaining material is mostly waste and passes into the large intestine, where more water is absorbed from it and the remainder is expelled as solid fæces from the rectum. The upper regions of the alimentary tract in healthy persons are comparatively free from living organisms, but the colon, or large intestine, where the waste of the body is dealt with, is inhabited by multitudes of bacteria of various sorts. These have their function in dealing with the work of the colon, but when they increase too greatly in numbers or invade the upper tract or neighbouring parts, they become harmful.

DIGITALIS POISONING.—Digitalis, the drug prepared from foxglove leaves, is in common use in the treatment of heart conditions, but may be taken accidentally, when it may cause unconsciousness and sudden death. Give an emetic if possible, followed by strong coffee. Keep the patient lying down and give stimulants, such as sal volatile, brandy, etc.

DILATATION OF THE HEART.—*See* HEART DISEASE.

DILATATION OF THE STOMACH.—*See* STOMACH, DILATATION OF.

DIPHTHERIA.—An infectious disease characterized by sore throat which has patches of membrane on it, and fever. On examination of the throat the membrane appears as greyish-white patches over the tonsils, uvula and soft palate. The disease if untreated is extremely serious, and the patient will probably die, but if the serum called diphtheria antitoxin is administered the severity of the attack is very greatly lessened and the chances of recovery are extremely good.

With the introduction of the antitoxin in treatment diphtheria has become a much less dreaded disease than it used to be, and it is nowadays seldom necessary for the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

operation of tracheotomy to be performed. The immunization for diphtheria which is now available for toddlers has reduced the prevalence and the severity of this infection. Treatment includes isolation.

DIPSOMANIA.—A dipsomaniac is a person who has periodic bouts of drunkenness over which he has no control. In this state he may commit criminal acts. During the interval between attacks the patient may be a pleasant and reasonable being. These cases can rarely be cured at home, but may do well if they voluntarily submit to treatment in a suitable establishment for a continuous period. Treatment by suggestion (hypnotism) has been found useful in some cases.

DISINFECTANTS. — These are substances which destroy germs. Of those easily accessible to everyone are carbolic acid (5 per cent), potassium permanganate (1 in 100), chloride of lime (¼ lb. to a gallon of water). These are obtainable in many preparations with trade names such as Condy's Fluid, Monsol, Lysol, Eusol, Milton, etc. All disinfectants are poisonous, though some are only slightly so. For the disinfection of bedding, clothing, etc., steam is the best method to use. To disinfect a room during use, mop the floor with a broom covered with a piece of cloth that has been dipped in a disinfectant. Sprinkle the same solution from time to time on the floor, dust furniture with a cloth damped in it, and put a few drops in all receptacles used in the room. Scald all dishes before allowing them to leave the room.

To disinfect a room after occupation, open all cupboard doors and pull out all drawers. Hang bedclothes loosely over the foot of the bed or a door. Paste thick paper over joins in the window frames and keyhole. Close the register of the fireplace and stuff any cracks with straw. Sprinkle water over the floor and walls to make the atmosphere damp. Set a fumigator in the middle of the room on a fireproof plate and light it, or if sulphur is being used, set the rolls of sulphur, broken into small bits, on a tray laid over a large dish of water, and light. When the door has been closed upon the burning disinfectant, remember to stop all escape of vapour from underneath the door. Leave the room for twenty-four hours, then unseal, open the windows, and the next day thoroughly clean. In the case of infectious diseases, advice and help in disinfecting will be given by the sanitary officer of the neighbourhood if asked.

DISLOCATION.—The displacement of an organ or bone of a joint from its normal position. Owing to the much greater frequency of bony injuries dislocation is usually understood to refer to joints. There are three types: (1) congenital dislocation, most common in the hip joint, is sometimes present at birth; the treatment is long and tedious, but without it the child would never walk normally; (2) diseases such as arthritis or tuberculosis are responsible for another group; (3) the traumatic group, however, is by far the most common. The dislocation may be complete, when the two bony ends are completely separated, or partial: it may be complicated by a fracture of the bone, and thus be a fracture dislocation, or a bony end may break through the skin, and thus give rise to a compound dislocation. Pain of a very sickening character is experienced when a joint is dislocated; the limb cannot be moved, and there may be swelling or deformity. Put the patient into a comfortable position, apply cold compresses and send for a doctor. In cases of shock, keep the patient warm and give a hot sweetened drink.

DISPLACEMENT OF THE WOMB. —*See* WOMB, DISPLACEMENTS OF.

DISSEMINATED SCLEROSIS.—This is a disease of the central nervous system in which there are patches of inflammation scattered throughout the spinal cord and brain. It is believed to be due to a germ which sets up a long train of symptoms. The limbs become paralytic and the bladder, the eyes and the speech become affected. The germ may have lain dormant for years, but the symptoms usually begin to develop between the ages of twenty and forty. The patient usually lingers on in a paralytic state for years; it is only in rare cases that death occurs a few months after onset of the symptoms. No treatment has been found satisfactory.

DISTURBED SLEEP IN CHILDREN. —*See* SLEEP, DISTURBED.

DIURETICS. — *See* MEDICINES, AND HOW THEY ARE MEASURED.

DIVER'S PALSY.—Caisson disease is the medical term for this complaint. It affects only divers and persons who work under compressed air. The symptoms are apt to come on when the diver emerges from the caisson or diving-suit; there may be paralysis of the lower limbs and bladder, headache, dizziness, and pains in the limbs and trunk. The remedy is to decompress the air the patient is to breathe—decompression chambers are now provided in this work.

DOUCHES.—A douche is a stream of water directed against a part of the body. There are various forms of douches and the vibrating effect is used a great deal in the treatment of rheumatism and nervous disorders. The *massage* douche is used for joint affections; a powerful jet of water is directed on to the affected part which is being massaged. The *needle* douche consists

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of a large number of fine jets which have a stimulating effect on the body. The *Plombières* douche is used to clear out the large intestine, as well as to stimulate and tone up the abdominal muscles. Douches are also used for spraying and cleansing the vagina.

DRAW-SHEET.—*See* NURSING.

DROPSY means the accumulation of watery fluid in the body and is not a disease in itself but a symptom of disease, most commonly of the kidneys or of the heart. *Ascites* is dropsy in the abdominal cavity, and *anasarca* is dropsy all over the body. In heart disease dropsy is most apparent in the legs, which swell up when the patient is walking or standing, the swelling disappearing in part when he has been lying asleep at night. In kidney disease (Bright's disease) the dropsy is usually apparent first under the eyes and then spreads so that the face is white and puffy. Dropsy of one leg is commonly due to phlebitis (white leg), which is common in women after childbirth or occurs after typhoid fever and other debilitating illnesses. The *treatment* of dropsy must be the treatment of the disease causing it; in the dropsy of heart disease rest in bed is necessary. In kidney disease meat and proteins are usually forbidden. Purges are often useful in diminishing the amount of fluid in dropsy, but in extreme ascites tapping may be necessary.

DROWNING.—When the body of an apparently drowned person is recovered, artificial respiration should be applied for two hours at least before hope of recovery is abandoned. (*See* ARTIFICIAL RESPIRATION.)

DRUG HABIT.—This can cover a very wide range since the body can accustom itself to any medicine taken with frequency. The taking of aperients as a routine often means that after a time greater doses are needed for the same result. In fact, the taking of drugs over any period for sleeplessness, pain or anxiety usually leads to a tolerance and necessitates an increase of the dose if the effect is to be maintained. In more extreme cases the person becomes obsessed for alcohol, opium, medinal or cocaine, and will go to any lengths to satisfy his craving. As there is generally a deterioration of body and mind, the addict has little strength with which to break the habit, and so the treatment has to become very strict and very specialized—usually in an institution under the care of a psychoanalyst.

DUCTLESS GLANDS.—*See* GLANDS.

DUMBNESS.—*See* DEAF-MUTISM.

DUODENAL ULCER.—The duodenum, like the stomach, is subject to ulcers. In the case of duodenal ulcers the pain comes on two hours after food and when the stomach is empty there is pain, which is immediately relieved by taking food or alkalis. Duodenal ulcers used to be much more common in men than in women, but now that so many more women are out working, there are many more cases of duodenal ulcer among them. The treatment is much the same as for other peptic ulcers and consists of rest in bed, rest for the stomach and the taking of alkalis in large quantities. Duodenal ulcers may persist for as long as twenty years, recurring two or three times a year, but they do not show the same tendency to turn malignant as do ulcers of the stomach. The danger with duodenal ulcers is perforation.

DUODENUM.—The first part of the small intestine beginning at the pylorus. It is eight to ten inches long. The secretions of the pancreas and the liver empty into the duodenum and it plays a large part in digestion.

DUPUYTREN'S CONTRACTION. — *See* FINGERS, CONTRACTED.

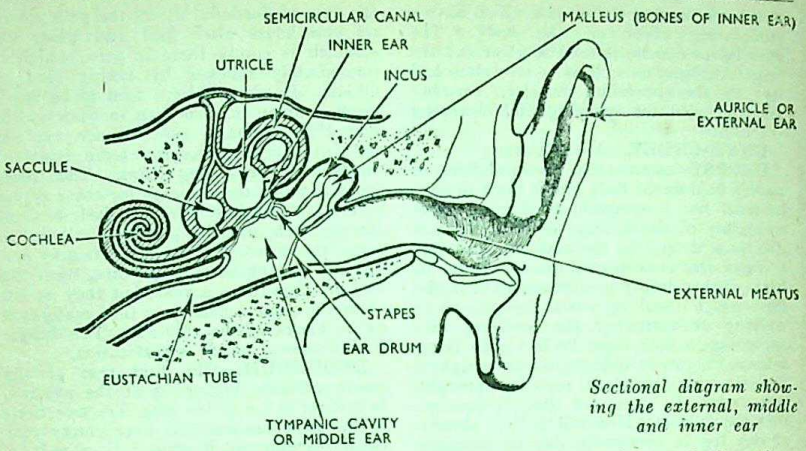
DYSENTERY.—This disease is constantly present in many warm climates and is characterized by severe diarrhœa in which there is great straining, and the stools are slimy and sometimes bloodstained. Dysentery may be due to several causes, but one form of the disease is due to an amœba, the *Entamœba histolytica*. Other forms of dysentery may be due to eating bad food or over-ripe fruit, and there are other micro-organisms which are responsible for onset. In crowded and insanitary surroundings dysentery may become a scourge, as among troops who were in the East during the First World War.

Treatment.—The patient should be put to bed and kept on a low diet; milk and beef-tea, etc. Doses of ipecacuanha are sometimes given, but injections of emetine form a much more satisfactory treatment. Other drugs used in this complaint are sulphate of soda, sulphate of magnesium, perchloride of mercury and calomel. Intense straining may be relieved by an enema containing about thirty drops of laudanum. A decoction of bael fruit is one of the native remedies by no means to be despised in cases of chronic dysentery.

DYSMENORRHŒA. — This term is applied to painful menstrual periods. Pain of a colicky type is usually in the lower part of the abdomen, also in the back and thighs, accompanied sometimes by sickness. The causes of dysmenorrhœa are various, but most cases are due to general nervous disorder of the patient. *Obstructive* dysmenorrhœa may be caused by displacement of the womb, especially backward displacement, or the presence of tumours, or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Sectional diagram showing the external, middle and inner ear

inflammation of any of the internal organs. General ill-health may lead to this complaint, especially if insufficient rest and nourishment are taken.

Treatment.—If the condition persists and is very severe, a medical examination is advised. The prevention of constipation is an important factor and salts should be taken every morning for a few days before the periods commence. There are many patent medicines advertised for the relief of pain during menstruation, but drugs such as aspirin or phenacetin taken in ten-grain doses may prove beneficial. A really hot bath at the outset is of great help, as anything which increases the circulation is of obvious benefit. In very obstinate cases psychological treatment will help; in others the minor surgical operation of dilatation will relieve.

DYSPEPSIA.—Disturbed digestion. It may be due to hyperacidity of the gastric juice, in which case it is called acid dyspepsia, or it may be due to lack of the normal acid in the stomach, in which case it is alkaline dyspepsia. There may be insufficient quantity or impaired quality of the gastric juices, or gastric catarrh. Nervous dyspepsia is characterized by gastric pains coming on when the stomach is empty and relieved by eating, and is often accompanied by palpitations. (For treatment, see INDIGESTION.)

EAR.—The ear is not only the organ of hearing, but is also concerned with the sense of balance. The organ of hearing consists of: the external ear, the middle ear and the internal ear. The external ear is shaped so as to bring, the sound waves to the passage, or meatus, leading to the middle ear. At the farther end of this passage is the drum, which, sound waves set in vibration, and then these waves are conveyed across the tiny space behind the drum, the middle ear, to the internal ear. It used to be thought that the sound vibrations were conveyed across the middle ear by the three little bones, or ossicles, of the ear; it is now considered more probable that these ossicles have a damping effect upon violent sound vibrations and thus have a protective function. The ear drum, also, has a less important part in hearing than used to be imagined; a person can still hear with a perforation in the ear drum, so long as no suppuration is going on; and, contrary to popular impression, hearing does not cease when the drum is incised for inflammation. The most important part of the organ of hearing is the internal ear; the third of the ossicles, the stapes (stirrup), has its base attached to a membrane which closes the oval window of the middle ear and movements of the stapes are communicated to the fluid, the perilymph which lies within the bony channels of the inner ear. The sound vibrations probably reach the perilymph through the membrane of another little window, the round window, into the inner ear. These movements are in turn communicated to the endolymph, which is another fluid inside the small membraneous canal which lies within the long channels of the inner ear, and movements of the endolymph stimulate the delicate nerve endings in the cochlea (so called because it is shaped like a shell), which is the essential organ of hearing and sends the vibrations to the hearing centre of the brain, where they are appreciated. The organ of balance consists of three little canals in communication with the internal ear called the semicircular canals. These

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lie in three different planes of the body, and movements of the endolymph in these stimulate delicate nerve endings, which help the brain to maintain equilibrium. Diseases of the semicircular canals, such as Menière's disease, affect the balance.

EAR, DISEASES OF.—Earache, or pain in the ear, is due most commonly to a boil in the external passage of the ear or to inflammation of the middle ear (behind the drum), usually from a throat or nose infection. But earache may not be due to an affection of the ear at all, the pain being referred from the teeth, from inflammation of the throat, or from neuralgia. The best simple treatment (if the ear-drum is not perforated) is to drop in warm (not *hot*) glycerine, or glycerine with 5 per cent carbolic acid. *Wax in the ear* is due to an accumulation of wax or cerumen, the natural secretion of the external ear passage, the glands which secrete it being modified sweat glands. Wax in the ear is best removed by gentle syringeing with warm water in which bicarbonate of soda has been dissolved (one half-tablespoonful to a pint).

Noises in the ear (Tinnitus) may be due to a great variety of causes, such as obstruction of the eustachian tube, certain forms of deafness, high blood pressure, low blood pressure, constipation, septic tonsils—in fact to almost anything that is likely to upset the general health and so upset or irritate the delicate internal organ of hearing. The noises are best treated by finding the cause and treating that; but they are often helped by a mild sedative, such as dilute hydrobromic acid. *Foreign bodies in the ear* are usually due to a child putting into the ear passage a bead or bean or something similar. They should be removed by gentle syringeing, but if they are firmly fixed in it is a matter for an ear specialist, as their removal may sometimes be very difficult. *Inflammation of the middle ear* usually arises from an infection of the throat or nose spreading up the eustachian tube to the ear; it may be extremely painful and require incision of the drum. The patient must not be afraid that this little operation will injure the hearing; on the contrary, the hearing will be preserved by letting out the pus, and the cut soon heals up. It is preferable to have this done than to allow the drum to rupture, which makes a ragged opening and does not give such good drainage. *Ear discharge* is nearly always the result of an acute inflammation of the ear which has not been cleared up, but sometimes, though more rarely, it may come from an eczema or other inflammation of the external ear passage. It is best treated by carefully mopping it out and blowing in boracic powder; dry treatment of this kind is better than syringeing or drops, though hydrogen peroxide drops remain a very popular method of treating ear discharge. It should be remembered that the ear discharge may be kept up by the presence of adenoids or unhealthy tonsils, which must be attended to. An ear discharge should always be taken seriously, as if neglected it may lead to a brain abscess, or a cold may light up the unhealthy middle ear and cause mastoid inflammation.

ECCHYMOSIS. — This denotes, the bursting of a blood-vessel into the underlying tissues of the skin causing discoloration; it is the underlying condition of bruising. Ecchymosis is very noticeable on the white of the eye; bleeding from the membrane lining the eye is very often set up by violent coughing or rubbing the eye too roughly, thus the eye becomes "blood shot."

ECLAMPSIA.—A convulsion occurring in a woman during pregnancy, childbirth or the lying-in period.

ECTROPION.—A condition in which the eyelids turn up.

ECZEMA.—Eczema is the term used to cover a multitude of skin affections but, practically speaking, it is an inflammation of the skin. The more chronic forms of eczema may be of the scaly type, but there is also the moist condition in which tiny blisters appear.

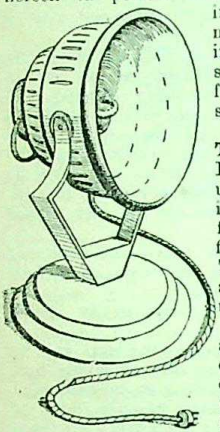
Causes.—Eczema may arise from many different causes. In some cases the condition is set up by the handling of dyes or stains, certain kinds of sawdust, sugar dust, or even certain flowers and fruits. There is the belief that some people develop eczema through being anaphylactic to certain things. In old age the skin may become irritable through lack of the proper nutrition, or poisons may be distributed from the stomach; in fact, there are innumerable causes for this skin complaint, constitutional as well as local.

Treatment.—The correct hygiene is, of course, of the greatest importance. The diet should be plain but nutritious, and the hours of eating and sleeping should be regulated; the proper activity of the bowels should be attended to; the use of plain water and soap should not be indulged in too frequently, and only the best baby soaps should be used; soothing remedies should be applied at first, gradually working up to the more stimulating varieties later on; the crusts and scales should be removed, and this may be made easier by applying strips of lint soaked in olive oil over the parts; boracic ointment may be applied to soothe any irritation. In cases of chronic eczema, it may be necessary to call in the medical attendant so that he may find out the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

correct treatment as quickly as possible. In children, teething is supposed to be responsible for some cases of eczema, and it has been observed that asthma is frequently associated with the condition. If the child is breast-fed, the mother should refrain from taking any stimulating foods and drinks, but it is important that she should take enough nourishment to keep herself in perfect health. In bottle-fed infants, if lumps of milk curd are found in the motions, a starch-free infant food should be substituted for milk.



Carbon - burning lamp for giving ultra - violet light treatment

ELECTRICAL TREATMENT. — Electricity has been used in medicine in many different forms for the last fifty years or more. The following are a few of the forms now in use:

Faradism. — The apparatus consists of a small battery containing one or two cells and an induction coil. The current may be applied locally to different parts of the body, or it may be given in the form of a bath to produce general stimulation. Conditions such as catalepsy, hysterical convulsions, sciatica, constipation, nervous headache or muscular debility are a few of the complaints which may be benefited by this treatment.

Galvanism.—The effect of this current produces chemical changes in the tissues. It is used a great deal in diseased conditions of the nerves.

X-ray Treatment.—This form of treatment is used extensively in skin conditions and is of great value in cases of cancer and rodent ulcer.

Radiant Heat.—In this form the electric current is turned into heat for external application; muscular rheumatism and inflammation of the joints and similar affections are treated in this way.

Light Treatment.—The ultra-violet rays are used from an arc lamp, or what is more usually termed the "Finsen light." Lupus or tuberculosis of the skin is the principal disease thus treated, but it is also widely used as an excellent general tonic.

Diathermy.—By this method, heat is generated in the tissues, thus raising the temperature of the blood. This form of treatment is used in cases of neuralgia, sciatica or chill, etc.

Electrolysis.—Superfluous hair or small moles or warts may be got rid of by this method of electrical treatment. It is also used in the treatment of neuralgia or to induce healing in wounds and abscesses.

ELEPHANTIASIS. — This uncomfortable parasitic disease is due to an infection by the filaria worm, which is carried through the medium of mosquito bites into the lymphatic vessel, where it breeds in large numbers. These tiny worms may cause various symptoms to arise, especially when an adult worm invades some of the lymph channels. The affected limb may swell to such enormous size that operative measures may have to be resorted to. The scrotum may also swell and become enormously enlarged. Chyluria is another symptom in which substances from the lymphatic vessels are found in the urine (milky-looking fluid).

EMBOLISM.—Obstruction of a blood-vessel, usually an artery, by a fragment of matter brought from another part of the arterial system. Sudden death may occur, especially in conditions like phlebitis and pregnancy.

EMBROCATION.—A liquid applied, especially by rubbing, to a part of the body.

EMETICS.—An emetic is a substance which produces vomiting. Common salt in warm water or mustard and water are substances which are always at hand and are very effective in their results. The simplest method is to tickle the back of the throat with the finger or a feather. An effective emetic for children consists of one or two teaspoonfuls of ipecacuanha wine. In cases of poisoning an emetic should never be given if the poisoning is due to a corrosive acid. (*See* POISONS AND POISONING.)

EMPHYSEMA is a condition in which the air spaces of the lungs are dilated and their walls thickened so that the lungs do not completely empty. Asthma, chronic bronchitis and whooping cough are frequent causes. This is one of the occupational diseases as it is often the result of lifting heavy weights, glass blowing and the playing of wind instruments. The symptoms are shortness of breath, puffiness and cyanosis. The treatment is relief of the symptoms and limitation of the causative factors.

EMPYEMA is pus in the pleural cavity and it is always a secondary condition, being a complication of pleurisy, pneumonia, tuberculosis or other general infections. The primary condition must be treated and the pus drained away.

ENCEPHALITIS LETHARGICA. — Epidemic encephalitis or "sleepy sickness" is a serious infection attacking the brain,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

causing a serious illness which, if recovery ensues, leaves many and varied symptoms in its train. The patient can be paralysed, have tremors, be apathetic or even confused.

ENDEMIC DISEASES.—A disease which is constantly present in any population in varying degree is said to be endemic to that population.

ENDOCARDITIS.—Inflammation of the endocardium or membrane lining the heart.

ENDOCRINE.—A name used to denote any internal secretion of the body.

ENDOCRINE GLANDS.—Those glands which secrete substances into the blood-stream direct, without a duct.

ENGLISH CHOLERA.—There is no cholera endemic in England nowadays, but it was common up to the seventeenth century.

ENLARGED GLANDS.—*See* ADENITIS.

ENLARGED PROSTATE.—The prostate often becomes enlarged in later life, and may interfere with the emptying of the bladder. It then requires operation.

ENLARGED TONSILS.—*See* TONSILS, ENLARGED.

ENTERIC FEVER. — Intestinal or typhoid fever.

ENTERITIS. — Inflammation of the intestine.

ENTROPION.—Inversion of the eyelid, so that lashes rub against the globe of eye.

EPIDEMIC CEREBRO-SPINAL MENINGITIS. — *See* CEREBRO - SPINAL FEVER.

EPIDEMIC DIARRHŒA.—This disease is known by many names, summer diarrhœa, choleraic diarrhœa, English cholera and, when it occurs in children, infantile cholera. It is one of the most fatal of the infective diseases in young children. It may occur at any season of the year, but it appears to be more prevalent during the summer months. The bacteria are conveyed through the medium of contaminated food. The food is usually contaminated by the common house-fly.

Symptoms. — The first symptoms are violent purging and vomiting accompanied by colicky pains and cramp in the limbs. The stools are usually foul and fluid and the patient often collapses through loss of body fluids. In children the condition very quickly reaches a danger point and may prove fatal. Fatal cases usually run on for about seven days, but in cases which recover three weeks may pass before the patient is restored to health.

Treatment.—The first thing the doctor will do is to endeavour to expel all irritating substances from the bowels by means of an aperient. The patient's thirst should be relieved and the cramped limbs rubbed with some liniment. If the patient should show signs of collapse, hot fomentations should be applied to the stomach and brandy and water may be given in small quantities. Children should be admitted to hospital if the attack is severe, as transfusions of saline must be given to restore the body fluids. Milk should not be given for some time after the attack is over, but may be replaced by meat juice and broths and buttermilk.

EPIDEMIC DISEASE.—A disease is called epidemic when it affects large numbers of people.

EPIDERMIS.—The outer layer of the skin.

EPILEPSY.—A chronic nervous disease in which there is a sudden loss of consciousness with convulsions. The attack lasts only a short time, and as the patient feels it coming on he frequently cries out before falling suddenly to the ground. Epilepsy takes two forms. In the minor or *petit mal* there is the same warning feeling or *aura*, but the attack consists merely of a feeling of dizziness or momentary loss of consciousness; whereas in the major form, called *grand mal*, the aura is followed by a convulsion or series of convulsions.

The cause of epilepsy is not known, but it appears to be due to some congenital tendency in the individual. It nearly always begins in childhood or at puberty. The number of males attacked is greater after puberty, but in early childhood the sexes are about equal. It runs in families and some authorities maintain that intemperance in the parents leads to epilepsy in the offspring. After an attack the patient may remain in a trance-like condition, in which he is not responsible for his actions and may be dangerous or even homicidal.

Treatment.—In the case of epilepsy in young children the parents should be warned that it is in most cases an incurable disease, and measures should be taken for it to interfere as little as possible with the education of the child, especially as the epileptic child is often quite bright and intelligent. Their weakness should not be pandered to, but treated firmly but kindly. At the same time all sources of annoyance should be removed as far as possible. The epileptic should be trained for some sort of work, but should avoid occupations that involve working amongst machinery or climbing heights. No epileptic should ever drive a car or swim. There are historic cases of epileptics of great mental and physical vigour, such as Julius Cæsar and Napoleon. Mental impairment sets in in a great many cases, and if such patients become irritable they should be placed in an institution, especially if they show signs of violence. Epileptics should never marry. During an attack the patient should be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

protected as far as possible from doing himself harm.

Place a piece of cork or rubber between the teeth and lay the patient on the floor, clear of furniture. Nothing further need be done unless the attack is unduly prolonged, in which case a whiff of chloroform or nitrite of amyl or a hypodermic injection of morphia may be given. Between attacks the diet should be moderate and salt-free, and in some cases vegetarian. The bowels must be attended to. Medicinally, the bromides and luminal are the drugs most used, but stronger drugs may be used on the advice of the doctor. The responsibility for the administration of the medicine should be taken by the patient's relations or friends, and they should know how to help him when the emergency arises.

EPIPHORA.—A persistent overflow of tears due to the tear-gland secreting fluid too rapidly, or to obstruction in the tear-ducts. In some cases a swelling may form on the inner side of the eye and the eyelids may become red and swollen. Treatment should consist of bathing the eye with warm boracic lotion (a teaspoonful of boracic crystals to a pint of water). If the lachrymal sac or the nasal ducts are affected it would be advisable to call in the aid of the doctor.

EPIPHYSIS. — A process of bone attached to a main bone by cartilage, until all growth in the bone has finished. Finally, the epiphysis makes full bony union.

EPIPHYSITIS.—Inflammation of an epiphysis.

EPISTAXIS.—Hæmorrhage from the nose.

ERUCTATION.—Belching.

ERUPTIONS IN THE COMMONER FEVERS.—The appearance of a rash on the skin is the first manifestation as to whether a fever is going to be eruptive or not, and the character of the eruption is a great help in the diagnosis. The chief forms of fever which produce a rash are measles, German measles, scarlet fever, typhoid (slight), chicken-pox, small-pox, typhus, erysipelas and cerebro-spinal meningitis.

ERYSIPELAS. — An acute infectious disease characterized by an inflammation of the skin and subcutaneous tissues. Erysipelas, sometimes called "the rose" from the colour of the affected parts, is caused by a germ of the streptococcus group. Infection usually occurs in connexion with wounds or cracks in the skin, but it may occur in persons living in insanitary surroundings. The face is the commonest site of infection, starting especially about the mouth, nose and eyes. The symptoms are high fever, shivering fits, headaches, vomiting and general malaise. The temperature usually remains high as long as the surface inflammation continues to spread. In the type known as erysipelas migrans (wandering erysipelas) several parts of the body become affected, apparently quite independently of the first infection. The inflammation usually ceases to spread after a week or ten days, but the patient may complain of sore throat, and frequently the lymph-glands of the neck may be swollen.

Treatment.—The patient must be isolated and put on a light diet consisting of milk, clear soups, beaten-up eggs and broths. Head pains should be relieved by the application of cold water or ice. Salicylate of soda, in ten-grain doses every four hours, may be given. The inflamed skin may be treated with ichthyol and protected with a layer of cottonwool. Lint which has been soaked in lead-and-opium lotion should be applied to the face in the form of a mask, and in the case of sore throat a gargle may be used consisting of diluted Condy's Fluid.

Serums and vaccines have been used in the treatment of this complaint; the vaccines especially have shown some promising results.

ERYTHEMA.—This term is applied to a redness of the skin which appears in many forms. In the simpler forms there is no inflammation, but in the more severe types the flow of blood through the affected part is obstructed, thus causing stagnation, and inflammation is set up. Among the inflammatory forms erythema nódosum is closely associated with rheumatism, anæmia and tuberculosis. Erythema intertrigo (chafing), erythema pernio (chilblain), frostbite and erythema multiforme are also types of inflammatory erythema. Attacks may be caused by irritation of the digestive organs or may be due to exposure to heat or cold; sometimes contact with coarse flannel, or dirty underclothing, or chemical or vegetable substances, will give rise to an attack.

Treatment.—In the simple forms, the cause of irritation should be removed. In the acute stage of erythema nodosum the patient should be put to bed and the affected limbs elevated. Salicylate of soda, five to fifteen grains, three times a day, may be administered. The spots may be treated with a compress of warm lead lotion; they should never be opened.

ETHER.—A thin, colourless, highly inflammable fluid, used chiefly as an anæsthetic.

ETHYL CHLORIDE.—An anæsthetic resembling chloroform in action but quicker and less lasting in effect.

EUSTACHIAN TUBE.—A canal connecting the pharynx with the tympanic cavity, conveying air to it. (*See* illustration in EAR.)

EXERCISES, REMEDIAL.—Exercises have proved to be of great value in cases of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

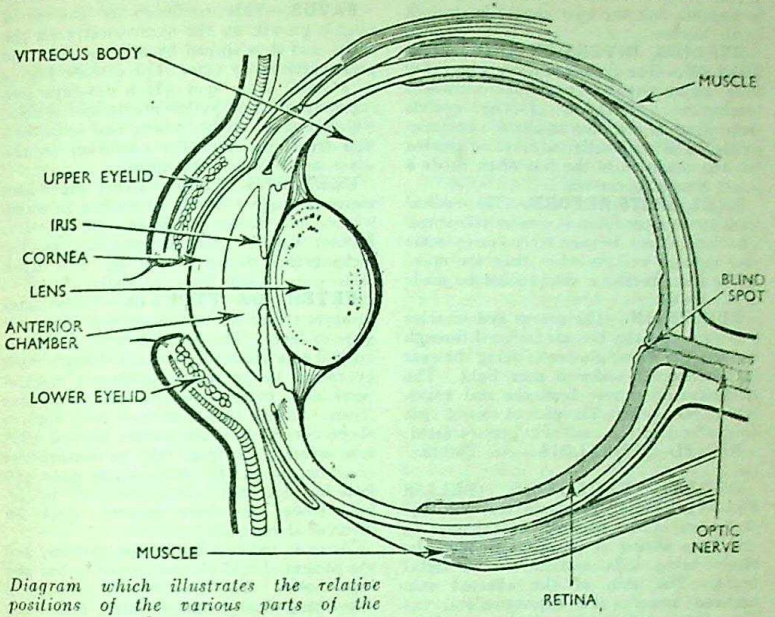


Diagram which illustrates the relative positions of the various parts of the human eye

deformity or injury and they are also of service in certain nervous diseases. Exercise should never be carried to the point of fatigue, exhaustion or palpitation of the heart.

EXOPHTHALMIC GOITRE.—A form of goitre or swelling of the thyroid gland, in which there is also great protrusion of the eyeballs. (*See* GRAVES'S DISEASE.)

EYE.—The organ of sight consists essentially of the retina, which is an expansion of the optic nerve into the back of the eyeball, on to which the rays of light are focused by the crystalline lens. The white of the eye is called the sclerotic, which is a fibrous covering of the whole eyeball. The iris, or coloured part of the eye, has an opening in its centre, the pupil, which dilates or contracts according to the amount of light that falls on the eye. The front of the eye is called the cornea, and this is transparent; it has a delicate lining, the conjunctiva, which also lines the inside of the eyelids and keeps the surface of the eye moist. Behind the cornea is the anterior chamber of the eye, filled with a watery fluid (*aqueous humour*). Then comes the *lens*, and behind this is the largest chamber of the eyeball, containing a clear jelly, the *vitreous humour*. Where the optic nerve enters the eyeball to spread out as the retina is known as the blind spot of the eye.

EYE, FOREIGN BODIES IN.—*See* FOREIGN BODIES.

EYELASHES, INGROWING.—Turning in of the eyelashes (trichiasis), may be a sequel to conjunctivitis or chronic inflammation of the edges of the eyelids. One or several of the hairs may turn towards the eyeball, causing much irritation of the transparent part of the eye. The lashes should be pulled out with a pair of forceps, taking care not to break the hair, thus leaving an irritating stump.

EYELID, TWITCHING OF.—This is due to a spasm of one of the muscles of the eyelid. It is usually indicative of a nervous temperament, or it may be brought on by worry and overwork. A tonic should be taken and as much rest as possible.

EYELID, UPPER, DROOPING OF.—Drooping of the upper eyelid (ptosis) is due to paralysis of a cranial nerve. Treatment should be directed to the cause of the paralysis.

EYELIDS, CYSTS OF.—These usually occur through the blocking of the ducts which open on the edges of the lids. The oily fluid which is secreted by the Meribomian glands accumulates and causes a swelling or cyst. Hot fomentations may

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be applied, but the cyst should be incised by the doctor.

EYELIDS, INVERSION AND EVERSION OF.—The eyelids of those who suffer from conjunctivitis very often turn inwards (entropion). Eversion of the eyelids (ectropion) is also due to chronic conjunctivitis. The conjunctivitis must be treated but the condition of the lids often needs a small plastic operation.

EYES, SPOTS BEFORE.—The medical term for this condition is muscæ volitantes. The "spots" can be seen when the eyes are shut equally well as when they are open. If the spots persist a visit should be made to the oculist.

EYESTRAIN.—The nerves and muscles of the eyes usually become fatigued through wearing the wrong glasses or using the eyes too strenuously under a poor light. The symptoms are severe headache and heaviness of the eyelids. The patient should visit an oculist and have suitable glasses fitted.

FACIAL NEURALGIA.—*See* NEURALGIA.

FACIAL PARALYSIS (BELL'S PALSY).—Facial paralysis may be due to disease of the mastoid, or exposure to cold from sitting at an open window, the result being inflammation of the facial nerve. The skin of the affected side becomes smooth and expressionless, the eye cannot be closed and the mouth is drawn to one side. The tongue on the affected side may be deprived of all sense of taste. When cold is the cause of the condition it may disappear in a few weeks, and treatment by galvanic electricity has been found beneficial. If the cause is due to a tumour, cure will depend on its successful removal.

FÆCES.—The stools or excrement from the bowel.

FAINTING.—This is due to a variety of causes, but weak action of the heart is the most common. Emotion may cause faintness, or fatigue, starvation, exposure to cold or heat, or physical causes, such as hæmorrhage. The patient's head should be lowered in order to allow the blood to flow to the brain, and if possible the patient should be taken out into the fresh air. Applications of cold water and smelling salts held under the nose may hasten recovery. When the patient recovers consciousness a little brandy may be given.

FALLING OF THE WOMB. — *See* WOMB, DISPLACEMENTS OF.

FALLING SICKNESS.—*See* EPILEPSY.

FALLOPIAN TUBES.—Tubes connecting the ovaries with the womb. (*See* SALPINGITIS.)

FARADISM.—A form of electrical treatment employed for the relief of sciatica, constipation, and muscular debility.

FAVUS.—This condition is due to a fungus growth on the skin, mostly on the scalp, and it is spread by mice or domestic pets, particularly cats. The disease begins as a small scaly spot which develops into cup-shaped bright yellow crusts on the skin, which produce slight itching and irritation. The treatment for this condition is the same as that for ringworm.

FEET, SWEATING.—Every night and morning the feet should be washed in warm water and dusted with boracic powder. Powder should also be sprinkled in the socks before putting them on, and fresh clean ones should be worn daily.

FEVER, OR PYREXIA.—Body temperature raised above the normal denotes a state of fever. The general term, fevers, is applied to a group of diseases characterized by raised temperature, quickened respirations and pulse, such as the infectious fevers. A rise of temperature two degrees above normal is slight fever; beyond 103° it is severe. The fever may be *continuous*; *remittent* when the temperature rises and falls but does not become normal; *relapsing*, when the fever returns after an interval of normality.

Fever is exhausting to the system, and the patient should always be put to bed and kept warm. The diet should consist of nourishing fluids; barley-water, cool weak tea, mineral or plain water, and lemonade may be taken freely, and a dose of salts often helps to reduce the fever. There are many drugs, vaccines, etc., which yield very good results but should be administered only under medical supervision.

FIBROIDS.—Fibrous tumours of the womb which do not require treatment unless they cause discomfort or hæmorrhage or other trouble. In some cases they are a cause of sterility.

FIBROMA. — A tumour composed of fibrous tissue, not dangerous to life.

FILIARIASIS.—*See* ELEPHANTIASIS.

FILTRATION OF WATER. — There are many ways in which water can be filtered in order to purify it, but perhaps the method which produces the best results is the sand filter. The water is allowed to drain through a bed of sand about three feet in depth and in this way most disease germs are removed. Chemicals are very often used instead of, or in addition to, filtration. The only sure method of purifying water is to boil it for about ten minutes.

FINGERS, CONTRACTED. — Dupuytren's contraction is the medical term given to this complaint. A contraction of one or more fingers is often associated with gout. A thickening in the palm of the hand is the first symptom, and a finger, or fingers, become drawn back into the palm. The patient loses the full use of his hand and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

operation may be necessary. Massage and thyroid extract in the early stages may do much to hinder the progress of the deformity.

FINSEN LIGHT. — *See* ELECTRICAL TREATMENT.

FIRST AID.—First aid to the sick or injured should be learnt by all responsible people. Classes are held for the purpose by the St. John Ambulance Association and the British Red Cross Society. (*See* BANDAGES; DISLOCATION; FRACTURES; HÆMORRHAGE; POISONS AND POISONING, *etc.*)

FITS.—A term applied to any sudden seizure in disease, but most commonly to epilepsy.

FLAT FOOT.—This condition often arises in young people whose occupation forces them to long standing or walking about. The ligaments in the sole of the foot sink so that instead of the foot being arched, the inner edge of the foot rests on the ground. A qualified chiropodist should pad the foot and give advice on wedged shoes and exercises. Massage and electrical treatment are of benefit.

FLATULENCE. — This is popularly called "wind in the stomach," and is due to gas in the intestines and stomach. This gas is the product of delayed digestion, improper feeding or disease of the alimentary track. It can also be caused by swallowing air. Gastric flatulence presses the diaphragm and very often causes palpitation and pain. Intestinal flatulence may set up severe colicky pains accompanied by rumbling noises owing to spasmodic contractions of the bowel.

Treatment.—When flatulence is due to dyspepsia, the sucking of a bismuth lozenge or peppermint is often helpful. Bicarbonate of soda, in teaspoonful doses, is also useful. Charcoal is an excellent remedy and this can be taken in the form of a biscuit. Care of diet and mastication are important. For intestinal flatulence, two grains of calomel taken at night followed by a dose of Epsom salts next morning will help to clear out all the disturbing gases.

FLEA-BITES.—*See* BITES.

FLOATING KIDNEY.—*See* MOVABLE KIDNEY.

FLUSHING.—This condition may be associated with many different causes—indigestion, too tight clothing, pregnancy, defective circulation or too much alcohol. During the change of life in women, flushing is prevalent and the patient may perspire profusely.

Treatment. — Whatever the cause of flushing, it is usually so closely associated with the nervous system that a sedative of some sort is suitable. Aspirin, one five-grain tablet, should be taken three times a day. Hot baths are sometimes beneficial and care should be taken of the bowels. Plenty of fresh air and a certain amount of exercise, with a diet which includes fresh fruit and vegetables, should be taken. Alcohol should be avoided as much as possible. If due to change of life, substances such as Stilboestrol may be useful on a doctor's prescription. Clothing should be light and loose.

FOLLICULAR CONJUNCTIVITIS.—*See* CONJUNCTIVITIS.

FOMENTATIONS.—A fomentation is the method used for applying moist heat to a part of the body to allay pain or to lessen inflammation. Some boric lint should be wrapped in a towel or wringer and boiling water poured over. It should be wrung out and applied as hot as possible by being placed over the affected part with a piece of oiled silk, then cotton-wool, and the whole kept in position by a bandage. For a belladonna fomentation, the affected part is first painted with a thick coating of belladonna and glycerine and then covered with boric lint as described above.

FOOD.—There are four classes of nutrient material which are necessary to the maintenance of health. They are called proteins, carbohydrates, fats and vitamins. A properly balanced diet consists of sufficient of each class and an excess of none. Different individuals require different amounts, according to their capacity for digestion. The typical meal is the mixed meal, in which some of each class are partaken of in the order in which the digestion deals with the classes, but some people find it advantageous to eat their carbohydrates at one meal and their proteins at another. Some diseases demand a diet almost entirely free from carbohydrates, whilst in other diseases proteins are contra-indicated, and in others fats must be reduced to a minimum. It will be seen, therefore, that diets like vegetarianism are excellent for a few people, but unnecessary or disadvantageous for the many, just as—though modern refined food does not contain sufficient indigestible matter or "roughage" to keep the bowels stimulated and avoid constipation in a normal person—there are many stomachs and intestines which cannot deal with any irritating matter. Except in the very normal and healthy person, therefore, common sense must be brought to bear on the question of adapting the diet to the individual requirements, and experience will be a better guide than a knowledge of the intricacies of the calorie system.

Proteins include meat, fish, eggs, cheese, nuts; carbohydrates are the starches and sugars; fats occur in both the animal and the vegetable kingdom and the vitamins are food elements found in a large variety of substances and without which a sub-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stance has no food value. They are described under a separate heading.

FOOD-POISONING. — Certain articles of food become noxious owing to improper methods of keeping. Tinned foods have been blamed in many cases, and sausages have been known to have the badness of the meat disguised with appetizing flavourings. Cooking is not always an adequate safeguard against poisoning, because, although the germ may be destroyed, it may have produced toxins which are unaffected by heat. If impure food has been eaten on an empty stomach, the symptoms will develop much earlier than otherwise; the time depends on how much poison was eaten. There is a rise of temperature with severe pains in the abdomen, and vomiting and purging are often present.

Treatment.—A medical man should be called in immediately, but until he arrives the pain may be allayed by application of hot-water bottles. Rest in bed is essential, and the diet should consist of liquids such as broths and white of egg.

FOREIGN BODIES.—A foreign body may be defined as an article in a part of the body where it has no business to be. A broken needle in the flesh, or a fish-hook, can be classified as a foreign body.

Foreign Bodies in the Nose.—Beads are often inserted by children into the nostrils as a result of some prank. The unaffected nostril should be closed by pressure of the finger and the other nostril strenuously blown. Sneezing may be induced by means of snuff or pepper. A syringe may have to be resorted to. The water should be warm, with a little salt added to it. The stream of water is sprayed up the clear nostril and the patient must keep his mouth open in order to enable the water to run down the other nostril.

Foreign Bodies in the Ear.—Insects or other small foreign bodies often find their way into the ear and cause much unpleasantness and deafness. The head should be placed in a horizontal position and warm water gently poured into the ear. A few drops of warm olive oil poured into the ear and allowed to remain for a short period will cause an insect to float to the surface. If the foreign body will not move, the medical attendant should be called in, as it is inadvisable for any unskilled person to use instruments in the ear.

Foreign Bodies in the Eye.—It is a very common thing for pieces of dust or grit to be blown into the eye. They can sometimes be shifted quite easily by drawing one eyelid over the other. If the foreign body can be seen clearly it may be removed with the corner of a pocket handkerchief. If a sharp substance has become embedded, castor oil should be dropped into the eye and the doctor should be sent for immediately. Very often the eye becomes so inflamed that even after the foreign body has been removed the patient still feels great discomfort.

Foreign Bodies in the Gullet.—When a foreign body is swallowed and enters the gullet it may set up irritation immediately, but in some cases it remains a considerable time before setting up any symptoms. If it becomes wedged inflammation and ulceration will occur. In the case of a swallowed fish bone or any small round object, the foreign body may be carried into the stomach by eating large amounts of bread or drinking a quantity of lime juice. In cases of failure to dislodge the foreign body, the doctor should be sent for.

Foreign Bodies in the Stomach.—In many cases such things as swallowed coins, pins, etc., may find their way from the stomach into the intestines without any treatment whatever. It is not advisable to give purgatives, but a diet of brown bread and fresh vegetables may assist passage of the object through the bowels. The motions should be examined to see whether the foreign body has been expelled.

Foreign Bodies in the Larynx and Windpipe.—Very often a severe slap on the back will cause a swallowed object to be coughed up. If this fails the doctor should be called in and he will remove it with instruments, or a specialist may be required.

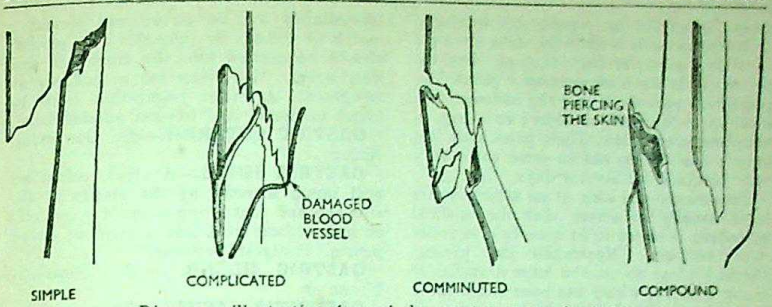
FOOT AND MOUTH DISEASE.—This disease may be caught from infected cattle. It begins with a mild fever followed in a few days by a crop of pimples in and about the mouth and sometimes throughout the whole body. There is greatly increased flow of saliva.

FRACTURES.—A fracture is the breaking of a bone, with or without damage to the surrounding tissues. Fractures are divided into various classes. If the bone is broken without any further damage it is called a *simple* fracture; if the skin is torn by the protrusion of the broken bone through it, the fracture is a *compound* one; if the surrounding tissues or blood vessels are also injured it is a *complicated fracture*, and may be a *compound complicated* one. A *comminuted* fracture is one in which the bone is smashed and splintered instead of being merely broken across. In a *multiple* fracture the bone is broken several times; and in an *impacted* fracture the broken ends of the bone are driven into one another. In children the bones do not snap easily but bend or splinter, and this variety of injury is known as a *greenstick* fracture.

The diagnosis of a fracture is a matter for medical care and skill, but in general it may be taken that a fractured limb is exceedingly painful and loss of power is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Diagrams illustrating four of the most common fractures

complete. Every injury where fracture is suspected should be treated as a fracture until it is proved not to be one, and in every case an X-ray examination should be carried out at the earliest possible moment. This is especially important where there may be a question of future "damages" or compensation.

Treatment.—The first consideration in the treatment of fractures is to reset the bones back to a normal position. In order to prevent any further damage, the patient must on no account be moved before the limb is secured in emergency splints of some kind. Before applying the splint, the limb must be straightened, the operator proceeding with the greatest care and gentleness. There is great danger of a *compound* fracture becoming infected from contact with outside materials. The bleeding must be stopped as quickly as possible (*see* HÆMORRHAGE), and the wound washed and covered with a piece of lint or linen wrung out of carbolic lotion 1 in 40; this dressing should be covered with a piece of oil-silk and the whole enveloped in a thick layer of cotton-wool and fixed by a bandage. It is important that the splints should be long enough to extend to the joint above and the joint below the fracture, and they must be carefully padded so as to fit the limb accurately. Where there is a fracture of the spine, pelvis or leg, the patient should never be moved unless on a stretcher; and a simple fracture may become compound unless handled very carefully. As there is always a certain amount of shock associated with fractures, the patient should be kept as warm as possible until the arrival of the doctor. This may be done by blankets, and a hot drink of milk or broth may be given.

FREEZING.—Freezing by ethyl chloride or carbon dioxide snow is used as a local anæsthetic in small operations and as a method of treatment in skin diseases.

FRECKLES.—These small pigmentation marks very often appear when the skin is exposed to the sunlight; fair skins especially seem to mark more easily than darker ones. Sometimes young children have a number of freckles on the face, but these may disappear as they grow older. Powdering the skin is helpful as protection.

FREQUENCY OF MICTURITION.—*See* MICTURITION, FREQUENT.

FROSTBITE.—When the body is exposed to intense cold for any length of time the skin first becomes red and tender, then numb and white, and finally it turns black. The part should be rubbed gently with snow or cold water in order to encourage circulation. On no account should the patient be allowed to stand over a fire, or any heat be applied to the frozen parts, as this will result in inflammation and gangrene. After circulation has been restored the parts should be wrapped up in flannel or cotton-wool; in cases of gangrene surgical aid will have to be called in.

FUNCTIONAL DISEASE. — Disease where the action of an organ is disordered but its structure remains unaltered.

FUNGI, POISONING BY. — Fungi mistaken for mushrooms are the usual cause of poisoning in this way. Violent pains are felt in the stomach and vomiting and diarrhœa follow quickly after. In bad cases death may take place owing to heart-failure.

Treatment.—An emetic should be administered at once, followed by a dose of castor oil. The patient should be kept warm and given stimulants.

FURRED TONGUE.—A furred tongue is a symptom of dyspepsia and many out-of-sorts conditions.

FURUNCULOSIS. — *See* BOILS AND CARBUNCLES.

GALL-STONES.—Gall-stones may form in the gall-bladder owing to abnormality of the bile flow or to infection by bacteria. A sedentary life is supposed to encourage stagnation of bile: other causes may be over-eating, or the taking of too little liquid. The stones—when formed—may be round, oval or pear-shaped; they may

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

appear singly or in considerable numbers.

Symptoms.—It is when the stone attempts to travel down to the intestine that the patient feels the most agonizing pains. The pains may spread all over the abdomen and even up to the right shoulder; an attack of vomiting may follow. These pains may last only a few hours, but in some cases they may continue for several days.

Treatment.—As soon as an attack occurs it is usually so severe that the medical attendant is called in at once to give relief with morphia. Meanwhile the patient should be kept warm, and large draughts of warm water, to which has been added some bicarbonate of soda, should be given. If the stones remain in the ducts or gall-bladder and no relief can be afforded to the patient, the question of operation will have to be considered.

GALVANISM.—A form of electricity used in electrical treatment.

GAMGEE TISSUE.—A dressing made of cottonwool between two layers of gauze.

GANGLION.—This is the term applied to cyst-like swellings which appear most frequently on the back of the wrist, but sometimes on the ankle or knee. They seem to be due to overstraining of a joint or a tendon, but unless they are unsightly they need not be removed.

GANGRENE.—Mortification is another term for this condition and, as the word implies, it means the death of a part of the body. This takes place owing to circulatory disturbances, which may be caused through various conditions such as diabetes and disease of the heart or the blood-vessels, or owing to the spasm in the blood-vessels which occurs in Raynaud's disease. In severe cases of frost-bite mortification may set in, the treatment of which is given in a previous paragraph.

Treatment.—The affected part should be thoroughly cleansed and kept clean with antiseptics. The dressings should be sterilized and the patient kept warm and well nourished. Amputation of an affected limb is usually carried out.

GARGLES.—Gargles are used to soothe the mouth and throat. Many different forms of gargle are used, but a very useful and safe one is a weak solution of hydrogen peroxide.

GAS, POISONING BY. — The First World War introduced many people to various forms of gas poisoning and to the terrible symptoms produced by it. The form of gas poisoning usually met with in every-day life is that due to carbon monoxide and carbon dioxide gas.

Treatment.—It is dangerous to enter a room filled with coal or charcoal gas unless the mouth is well covered with a wet handkerchief. The windows should be opened immediately and on no account should a match or candle be lighted. The patient should be carried into the fresh air and kept warm. Hot sweet tea or coffee may be given. Artificial respiration may be found necessary and oxygen administered.

GASTRIC CATARRH.—*See* GASTRITIS, ACUTE.

GASTRIC JUICE.—A clear, colourless acid liquid secreted by the glands of the stomach and containing a small proportion of hydrochloric acid and a ferment called pepsin. It digests proteins.

GASTRIC ULCER. — *See* STOMACH, ULCER OF.

GASTRITIS, ACUTE.—This is also popularly called gastric catarrh and is often secondary to some other disease, such as influenza or scarlet fever; or it may even be produced by the wrong sort of food or the habitual use of too much alcohol. The symptoms are similar to what is commonly known as a bilious attack. There is pain in the abdomen, with nausea and vomiting, the tongue is furred and the breath offensive. There may be complete loss of appetite accompanied by a great thirst and sometimes headache. The bowels may be constipated, or there may be some diarrhœa.

Treatment.—Plenty of warm water with bicarbonate of soda should be given to clear the stomach of the offending irritant. Do not confuse this treatment with that for appendicitis. No food should be given at first, and when allowed it should consist of such things as milk, chicken broth or beef tea and milk puddings. For severe thirst it is a good thing to sip barley water or suck a piece of ice.

GASTRITIS, CHRONIC.—This may follow an attack of acute gastritis, or it may be due to some other disease. The symptoms are similar to those of acute gastritis but are either persistent or recurrent. The cause should be found and the diet adjusted as needed over a long period.

GASTRO-ENTERITIS. — The intestines as well as the stomach become inflamed, usually due to the consumption of bad food. There is acute pain in the stomach accompanied by vomiting, diarrhœa and fever.

Treatment.—An aperient or an enema should be given to clear out the bowels, and the pain in the abdomen may be relieved by the application of hot fomentations, and brandy and water may be given in small quantities. The diet should consist of meat juices, whey and broths, and no milk should be given for some time after the attack is over.

GENERAL PARALYSIS OF THE INSANE.—This condition is caused by syphilis affecting the brain. The symp-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

toms of insanity may take years to develop, but they usually appear between the ages of thirty and fifty. The patient suffers from sleeplessness, the speech becomes slurred, the hand shaky, and wild delusions of grandeur are indulged in. Gradually the patient loses strength and the brain becomes confused. Finally, general paralysis may arise with loss of all mental faculties, the patient lying helpless until death mercifully releases him. The modern treatment of general paralysis of the insane is to inoculate the patients with the germ of malaria, the idea being that the very high temperature caused by the malaria apparently destroys the toxins of the general paralysis.

GENU VALGUM.—*See* KNOCK-KNEE.

GERMAN MEASLES.—This disease, although it resembles measles and scarlet fever, is of quite a distinct character, but it is much less infectious. It usually occurs in epidemics, but there are no after complications and the disease is usually a mild one. The period of isolation should last for one week after the rash has disappeared and for those who have been exposed to infection a quarantine of twenty-one days should be enforced. The first symptoms are headache, pains in the back, sore throat and rise of temperature. The rash may take two or three days to appear, coming out first on the face and neck. The glands of the neck swell and the eyes may have a puffed appearance. The rash may run together in large patches, but it usually disappears in about four days. Feverishness may be entirely absent in some cases, but when present it is never very severe.

Treatment.—The patient should be kept in bed and isolated from other children. The diet should be very light, and during the period of convalescence a tonic may be given.

GERMS.—*See* BACTERIA.

GIDDINESS, or vertigo, is a symptom of some other disease, so a medical examination is necessary to determine whether or not the malady is serious. It can affect the patient in two ways, he having the illusion either that he himself is spinning round or that things are spinning around him.

Giddiness is generally caused by simple things such as gastritis or eyestrain, or chronic ear disease (Menière's); or it may be of more serious consequence, being caused by disease of the brain. Treatment will depend on the cause of the condition.

GIGANTISM.—The growth of the body depends to a great extent on the normal secretion of the pituitary gland. If this gland secretes in excess, it causes an overgrowth of the body and so the condition which is known as gigantism arises.

GIN-DRINKER'S LIVER.—See CIRRHOSIS OF THE LIVER.

GLANDERS.—This disease is very common in horses and it can be conveyed to man by a germ (*Bacillus mallei*). The first symptoms usually appear about three days after infection. The patient feels wretched and a sore spot will develop on the site of inoculation. This sore should be excised and cauterized. The infection usually spreads, and little more can be done than to attend to each symptom as it arises. If the infection is in the nose, there will be ulceration and a great amount of pus discharged. Disinfectants should be used liberally and all abscesses treated surgically. The patient's strength should be maintained with nourishing soups, and stimulants and injection of the vaccine should be tried.

GLANDS.—This term is used most commonly when referring to the lymph glands (*see* ADENITIS), but glands or secretory organs are found everywhere in the body, and are of two main types: (1) those whose secretions are collected into ducts; and (2) the ductless glands, whose secretions are passed directly into the bloodstream. Of the first type the salivary glands, the glands of the skin, of the lining of the stomach or of the kidney are examples. The chief ductless glands are spleen, thyroid, pituitary and suprarenal capsules. These ductless glands govern growth and emotions. The proper functioning of the body as a whole depends largely on the normal working of the secretions of the ductless glands, for their lack or their excess determine what we look like and how we act.

GLAUCOMA.—This is a disease of the eye which arises only in people over middle age. The eye may look normal but the patient may complain of dimness of sight and of the appearance of coloured haloes when looking at a light. It may be brought on by prolonged mental depression, exposure to cold, or by excessive fatigue. The optic nerves are compressed and the circulation is interfered with, thus causing an increase of tension inside the eye. *Treatment.*—Operation is usually indicated, to relieve the tension. The general health should be toned up. On no account should atropine drops be put into the eye, as this tends to expand the pupil and aggravate the condition, which is a serious one.

GLEET.—The mucopurulent discharge of gonorrhœa.

GLIOMA.—A tumour of the brain.

GLOSSITIS. — Inflammation of the tongue.

GNAT-BITES.—*See* BITES.

GOITRE.—This term is applied to swellings in the thyroid gland, which lies in front of the windpipe. There are two dis-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tinct forms, simple goitre and exophthalmic goitre. Simple goitre may be the result of drinking water which does not contain the normal amount of iodine. It is supposed to be more prevalent in the narrow valleys around mountainous districts, and the disease was so common in Derbyshire that it was known as "Derbyshire neck." The swelling may take years to develop and it usually begins in the early teens. The growth may develop into an enormous size, causing pressure on the windpipe or gullet, giving rise to difficulty in breathing and swallowing. The patient should, if possible, change his residence to another area; in many mild cases this is all that has been required for a cure. If this cannot be effected, care should be taken that all the water consumed by the patient is boiled in order to destroy all germs. Many cases benefit by the internal administration of iodine. Operation may have to be resorted to if the swelling becomes too large for the patient's comfort. Exophthalmic goitre is discussed under the heading of Graves's disease.

GONORRHŒA.—The chief symptom in this disease is the appearance of a thin, whitish discharge from the urethra. A sensation of hot, burning pain is felt when urine is passed. The lips of the orifice become red and swollen, and the discharge becomes thicker in character and of a yellowish colour.

This disease is caused by a germ, the *gonococcus*, and the infection is usually acquired through sexual intercourse. Much depends on preventing the germs from passing deeper into the urethra, or, in the cases of women, into the womb. If due precautions are not taken quickly, the condition may become one of chronic discharge or, as this stage is called, gleet. In men the glands of the groin may become enlarged, and abscesses may form in them. The testicles may become swollen and tender, the prostate gland may become inflamed, or gonorrhœal rheumatism may arise. Gonorrhœal ophthalmia, or inflammation of the eyes, may arise from careless transference of the discharge into the eye. In women the complications of gonorrhœa are less painful but more serious than in men; sterility is often caused by this complaint. If neglected in its early stages, gonorrhœa may cause abscess formations, especially in the tubes of women, and it can also set up infections in joints, tendons, heart and muscles.

Treatment.—Provided it is caught in the earliest stages, the disease nowadays is definitely curable, comparatively quickly and certainly, by means of the sulphonomide preparations and penicillin injected into the muscles.

Free treatment is provided by special clinics attached to most London and Provincial hospitals. The desirability of early treatment cannot, however, be over-emphasized. On no account should persons who suspect that they are infected waste time by futile treatment with quack remedies.

GOUT.—A painful disease in which there is an excess of uric acid in the blood. Heredity is important and men are more often attacked than women. Alcohol plays a large part in the causation of gout, and the fermented liquors are more dangerous than distilled spirits. Rich food in excess combined with lack of exercise and indulgence in liquor may mean suffering not only for the patient but for his grandchildren. It is a mistake, however, to suppose that gout is confined to the wealthy classes. The combination of poor food and faulty hygiene—with over-indulgence in malted liquors—causes "poor man's gout." Workers in breweries and other people who deal with large quantities of alcohol are very liable to gout.

An acute attack of gout begins with warning twinges of pain in the joints of the hands and feet, and the patient becomes restless and irritable. The urine is acid, scanty and high-coloured. Then, in the small hours of the morning, the patient may be awakened by a severe pain in the big toe, usually on the right side, which becomes rapidly swollen, red and shiny and agonizingly painful. The temperature rises. The pain subsides somewhat during the day but returns in full force at night. There may be three or four of these attacks during the year. Hard, stone-like deposits in the cartilage of the ear or round the knuckles of the hand are characteristic of gout, and are called tophi. There is a saying, "Once gouty, always gouty," which may be taken as generally true to the extent that the person with a gouty family history should regulate his life with the end in view of keeping gout at bay, and with the advancement of knowledge of hygiene and health matters in this generation there is no need for anyone to become a victim to the acute attacks which were taken as a matter of course fifty years ago. In fact gout is no longer the scourge it was, although what is called the "gouty diathesis," or predisposition to gout, is still with us in a considerable proportion of the population.

Treatment.—People with the gouty diathesis should live temperate lives, eating moderately of a diet restricted in meat and starches. Alcohol should be avoided and salt left out of the food. Large quantities of mineral water or ordinary water should be taken between meals. The value of spa treatment lies simply in the fact that it

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

makes it easy for the patient to break completely with the bad habits of diet and hygiene which surround him at home.

GRAND MAL.—*See* EPILEPSY.

GRANULAR OPHTHALMIA.—A form of conjunctivitis.

GRAVEL.—A sand-like material passed with the urine. It is of the same composition as the stones found in the bladder. A similar sand or gravel is sometimes found in the stools of rheumatic persons.

GRAVES'S DISEASE.—This is another term for exophthalmic or toxic goitre. In this disease there is not only swelling of the thyroid gland in the neck, but there is protrusion of the eyes, nervousness and rapid action of the heart. The condition is a serious one, and is much more common in women than in men; it is due to excessive secretion of the thyroid gland. The patient is exceedingly nervous and irritable and the skin readily flushes with any excitement, while perspiration is often noticeable. The swelling may not reach the size it does in simple goitre, but one side is very often more enlarged than the other.

Treatment.—The chances of complete recovery are good in a very large proportion of cases, while in others a few of the symptoms may still remain. Much depends on good nursing and complete freedom from excitement and worry. The patient at first must be kept in bed but later should be encouraged to spend as much time as possible out in the open air when the weather is suitable. The diet should be very light and nutritious, while alcohol, strong tea and coffee should be avoided. Removal of part of the thyroid gland has proved to be of benefit to the patient, and although serious, it is being performed increasingly.

GREENSTICK FRACTURE. — Fracture of a limb in a child. The bone bends but does not break completely across.

GREY HAIR.—This is not always a sign of old age, as many quite young people turn grey, and even white, very early in life. In some cases it may be hereditary; it may also be caused by disease. There is a certain amount of scepticism as regards the fact that people may turn white in a night through grief or shock, but authentic cases have been known, although it is very rare.

GROWING PAINS.—Pains in the limbs of growing children used to be considered to be due to their growth but are now known to be rheumatic and should be attended to, in order to avoid damage to the heart and severe rheumatism later on in life.

GUINEA-WORM DISEASE. — This is met with in many parts of the tropics, especially on the West Coast and in certain parts of Brazil. It probably enters into the human body as a larva in the drinking water. It finds its way from the stomach into the tissues of the body and finally settles under the skin of the legs. There it begins to grow, and a boil-like spot appears on the skin. When the spot bursts, milky fluid can be seen oozing from it which contains thousands of embryo worms. The head of the worm may be seen, and extraction may be carried out under surgical supervision.

GULLET, FOREIGN BODIES IN.—*See* FOREIGN BODIES.

GULLET, STRICTURE OF. — *See* ŒSOPHAGUS, STRICTURE OF.

GUMS, SPONGY.—These are always a sign of ill-health and are due to a lack of Vitamin C in the diet.

GUMBOIL.—The cause is usually to be found in a decayed tooth and is due to suppuration extending from the tooth into the gums. It is better to have the abscess incised by the doctor than to allow it to burst in the mouth. The mouth should be rinsed out frequently with antiseptics, and the offending teeth extracted as soon as the patient is well enough to see the dentist. (*See* ALVEOLAR ABSCESS.)

HÆMATEMESIS.—Vomiting of blood which comes from the stomach. The patient should be kept quiet, lie still and suck ice, and a doctor should be sent for.

HÆMOPHILIA.—People suffering from hæmophilia are known as bleeders, because the flow of blood from the slightest scratch or wound is stopped only with the greatest difficulty. Spontaneous bleeding may arise without any apparent cause, not only from the nose but internally from the stomach and bowels. This condition is hereditary and is passed on in a very curious way. The daughter of a bleeder, although she may show no symptoms of the disease herself, will pass it on to her sons, and so the affection is inherited, always through the female side of the family. The cause of the complaint has not yet been discovered. The tendency to excessive bleeding often becomes less as the patient grows older, but unfortunately too many cases die while still very young.

Treatment.—For the arrest of hæmorrhage a firm bandage should be placed over the bleeding point and those drugs which have the property of checking hæmorrhage should be tried. Children who inherit this disease should be very carefully guarded against all accidents, and operations such as tooth-pulling, etc., should be undertaken only when absolutely necessary. Daughters of hæmophilic fathers should avoid marriage, as this would seem the only way to stamp out the disease.

HÆMOPTYSIS, the spitting up of blood, is a symptom to be taken seriously, as the spitting up of blood in any quantity (apart from mere streaks in the sputum) is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

usually a symptom of tuberculosis of the lungs.

HÆMORRHAGE is bleeding and can be from a vein or from an artery. In *venous hæmorrhage* the blood is dark blue in colour and issues in a continuous stream from the cut end of the blood-vessel as it is going to the heart. In *arterial hæmorrhage* the blood is bright red in colour and issues in spurts as the cut end of the blood-vessel is nearer the heart. Types of hæmorrhage include hæmorrhage into the brain (apoplexy); hæmorrhage from the lungs (hæmoptysis); from the stomach (hæmatemesis); from the nose (epistaxis); from the womb (accidental hæmorrhage); in the urine (hæmaturia); and in the stools (melæna). In most of these conditions the hæmorrhage may be a serious matter, and a doctor should be consulted at once. In many cases the patient should be laid flat on his back, *no* stimulant should be given, and cold applications (ice-bags, or cloths wrung out of cold water) applied over the affected part. Pinching the nostrils together firmly is usually enough to stop nose bleeding.

External hæmorrhage is usually the result of an injury, and the first-aid treatment of it consists in the application of pressure, either by the finger and thumb or by a tourniquet or by a pad and a bandage. For venous hæmorrhage pressure, by a compress wrung out of cold water or by a clean handkerchief, is usually sufficient. To stop arterial hæmorrhage some knowledge of the chief arteries is necessary; the large veins, such as the jugular vein in the neck and the femoral vein in the thigh, which run alongside the main arteries in these regions, should be treated in the same way as arteries. Hæmorrhage from the neck may be due to attempted suicide (cut throat), and the chief artery is the carotid. To stop hæmorrhage from the *carotid artery* is always difficult and may be impossible, and it is necessary to push the thumb directly into the wound; push it backwards and inwards and grasp the vertebral column with the finger, trying to compress the vessel between the thumb and fingers. Hæmorrhage from the *facial artery* may be stopped by pressure over the facial artery where it crosses the lower jaw, about an inch and a half from the angle of the jaw. Hæmorrhage from the *temporal artery* is stopped by pressure in front of the ear; a pad may be fixed there and a bandage applied round the head. Hæmorrhage from *a tooth socket*: it may be necessary to apply a piece of cotton-wool, wrung out in turpentine or iodine, to the gum and close the mouth upon it, tying a bandage round the head and under the jaw. Hæmorrhage from the *armpit* is from the subclavian artery, and is stopped by firm pressure on the artery in the hollow behind the collar-bone, or else by a firm pad and bandage in the armpit itself. Hæmorrhage in the *upper arm* is controlled by a firm pad over the bleeding point and a bandage round the arm; it may be necessary to apply pressure over the brachial artery over the inner aspect of the humerus bone. Hæmorrhage in the *forearm* is stopped by bending the elbow-joint, placing a pad in the bend between the upper arm and forearm and applying a bandage round them both, from the wrist to the armpit. Hæmorrhage from the *hand* is stopped by applying pressure to both the radial and the ulnar arteries, about one inch above the wrist. In the *palm of the hand* a firm pad is applied over the wound, the fingers closed upon it and a bandage fastened round them. Hæmorrhage from the *thigh* is controlled by firm pressure with both thumbs over the femoral artery at a point where it crosses over the bone of the pelvis (in front of the haunch bone), or else a tourniquet may be used. Hæmorrhage from the *lower leg* should be treated by placing a firm pad in the hollow behind the knee and bending the leg up against the thigh and fixing it there with a bandage. Hæmorrhage from the *foot* may be treated in the same way, or with a pad over the wound and a firm bandage over it and round the foot.

HÆMORRHOIDS.—*See* PILES.

HAIR, CARE OF.—No hard and fast rule can be laid down as to how often the hair should be washed, but in towns, where there is so much soot about, it would be advisable to shampoo the hair about once every ten days. Good brisk brushing every night and morning will impart that much-to-be-desired glossy look to the hair and will also keep it clean and in good condition. Greasy hair should be washed oftener than dry hair, but if it is abnormally greasy a specialist should be consulted.

HAIRINESS. — Sometimes this complaint concentrates on one spot, such as the upper lip or on the chin of women, but at other times it is more widely distributed. The tendency to hairiness may be glandular in origin and in these cases medical treatment helps. Where the hairs are few in number they may be removed by electrolysis. Shaving and plucking out the hairs with tweezers is the only alternative in excessive growth, but the hair is apt to grow thicker and stronger than before. The use of depilatories must be practised only with discretion.

HALLUCINATION is the term applied to the perception of an object which has no existence in reality.

HAMMER-TOE.—This condition may be present at birth, but it is usually due to the wearing of ill-fitting boots. One of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

toes, nearly always the second toe, becomes bent like the claw of a hammer, and walking, in consequence, becomes a very painful procedure. In slight cases the deformity may be corrected by manipulation, but where the deformity has become fixed, an operation will be necessary to put the toe straight.

HANDS, CHAPPED. — *See* CHAPED HANDS AND LIPS.

HANGNAIL.—This is a term applied to the shreds of skin which sometimes appear round the base of the nail. They may become very painful if not cut away and treated. A little boracic ointment should be applied or the part painted with tincture of iodine.

HARD CHANCRE.—*See* SYPHILIS.

HARE-LIP.—This is a very common malformation of the face, which in some cases not only involves the lip but may extend to the nostril. In some cases the furrow is in the middle of the upper lip, but the malformation occurs more frequently on one side, usually the left. The only treatment is by means of an operation, which should be done within a few months of birth.

HAY FEVER is a form of allergy (*see* ALLERGY) which occurs as a recurrent catarrh of the nose and eyes in the late spring or the autumn, and lasts about four to six weeks. It may be comparatively slight, or may be so distressing that the person affected is quite unfit for any work. It is due to an individual sensitiveness to the pollen of timothy grass or other plants or trees which are pollinated by the wind. Plants pollinated by insects, such as roses or daisies, do not cause hay fever unless they are sniffed. Pollen vaccines are now prepared and are successful in some cases, and some people receive benefit by cauterization of sensitive spots in the nose or by nasal operations when nasal obstruction is present. Sprays or injections of adrenalin or the administration of ephedrine are recent remedies which are often effective, but in some cases adrenalin causes a worse irritation even than the hay fever. A holiday at the seaside or on board ship may prove the only means of alleviation.

HEADACHE may be due to a great variety of causes, some trivial, some serious. Probably the commonest cause of a persistent headache is eyestrain, due to a slight degree of astigmatism which may not be realized by the patient but will be obvious if the eyes are examined by a doctor or a qualified optician. Nasal obstruction is another common cause of persistent headache, which will be revealed on expert examination of the nose and can usually be treated easily. Over-eating, dyspepsia and constipation; hunger, fatigue and unhappiness; neurasthenia, anæmia and menstruation; excessive use of tobacco, tea or coffee—all of these are among the causes of headache. Prolonged and very severe headache, on the other hand, may be due to brain tumour, brain abscess, or the onset of meningitis, and so should receive the early attention of a doctor. *Migraine* or *hemicrania* is the term applied to localized, periodical headache, which may be limited to one side of the head and may last for minutes, hours or days; it is often associated with giddiness, sometimes with nausea and vomiting, or flashes and spots of light in front of the eyes. It tends to run in families and the cause is often obscure.

For the *treatment* of severe headache, the patient should go to bed in a darkened room, with cold application to the head and hot bottles to the feet. Menthol or menthol ointment may be rubbed on the forehead. A five-grain tablet of phenacetin along with a five-grain tablet of aspirin should be given, and repeated if necessary; aspirin alone, in a dose of one to three five-grain tablets, may suit some patients better. The proprietary preparations, "Antikamnia" and "Cachets Faivre," are useful combinations of drugs which some patients prefer to phenacetin or aspirin alone. After any of these sedative drugs a brisk saline purge (seidlitz powder or Epsom salts) is desirable.

HEART.—*See* CIRCULATION OF BLOOD.

HEARTBURN.—This condition derives its name from the burning feeling which extends from the stomach through the chest to the mouth, due to excess of acid in the stomach. The diet should be regulated, and too much tea, alcohol or condiments should be avoided. Bicarbonate of soda, about fifteen grains, should be taken in a tumblerful of hot water twenty minutes before meals. Heartburn is often present during pregnancy.

HEART DISEASE may be either *functional* or *organic*. *Functional disease* is more properly called functional disorder than disease, and means that although the patient may complain of palpitation, pain in the region of the heart or down the left arm, or fainting, these are the symptoms not of actual disease of the heart itself but of such disorders as dyspepsia, over-use of tobacco, neuralgia or perhaps kidney disease, which upset the working of the heart; the treatment of such functional disorders is to find the real cause and treat that. *Organic disease* of the heart is most commonly caused by rheumatic fever or infectious fevers such as diphtheria or influenza. The toxins from these diseases affect either the heart valves (*valvular disease*) or the heart muscle (*myocarditis*). Inflammation of the membraneous outer

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lining of the heart (pericardium) is called *pericarditis*; there may be an effusion which may have to be drawn off by the doctor with a needle; in any case prolonged rest in bed is necessary. *Valvular heart disease* is the result of rheumatic fever or other disease affecting the inner lining of the heart in the region of the valves, so that either they do not shut properly or else they are hardened and do not open properly. Because of the extra work it has to do in forcing the blood through the affected valve, the heart muscle may become thicker and stronger, and the circulation not appreciably affected; this is called *compensation*, and if the heart disease is well compensated the patient's expectation of life is nearly as good as with a normal heart. If, however, the heart muscle is unable to adjust itself to the strain, the walls of the heart sag and the heart becomes *dilated* and flabby; such a condition may require treatment by prolonged rest in bed and then by graduated exercises. In *myocarditis* the heart muscle is affected, and then may result the condition known as *auricular fibrillation*, in which the ventricles (the chief pumping chambers) beat irregularly, and the auricles (which receive the blood) are unable to do their work rhythmically. Such a condition requires careful treatment by a physician.

HEATSTROKE AND SUNSTROKE.—The exposure to excessive artificial, as well as solar, heat may cause heatstroke, which is a more serious form of sunstroke; the effects of exposure to the direct rays of the sun are known as sunstroke. If these strokes occur in other than the tropics, there is almost always some other factor at work, usually exhaustion and fatigue.

Heatstroke.—The patient usually becomes unconscious, the face is flushed and red, and the breathing and pulse are both rapid; the temperature may rise very rapidly. All clothing should be removed from the head and chest and the patient allowed to lie with the head and shoulders raised. Ice-bags or cloths wrung out in cold water and vinegar should be applied to the head and spine. Cold water may be douched over the head and chest until the temperature has fallen at least three degrees. The patient is then put to bed, with warm blankets and hot-water bottles to encourage free perspiration. When the patient is able to take food it must be light and given at frequent intervals.

Sunstroke.—The patient usually complains of headaches, sickness and giddiness. The pulse is weak and the skin is pale and sweats freely. The patient should be removed to a cool place and clothing removed from the body. Cold water should be sprinkled over the head and chest and, if the patient is conscious, a cooling drink may be given.

HELIOTHERAPY. — Treatment by exposure to the sun's rays.

HEMIPLEGIA.—*See* APOPLEXY.

HEREDITARY DISEASE. — *See* INSANITY.

HERNIA.—*See* RUPTURE.

HERPES ZOSTER.—*See* SHINGLES.

HICCOUGH.—Hiccough is due to a sudden violent contraction of the diaphragm. It is met with in drunkards, or it may be induced by eating peppery foods or taking hot drinks. As a rule the attack only lasts a short time, but in severe cases it may last hours, or even days; when it comes on severely in a person who is very ill, it is always a serious omen.

Treatment.—In slight cases the hiccough may go away by stretching the diaphragm and holding the breath for as long as possible. Sometimes a drink of cold water, sipped very slowly, may have the desired effect. In severe cases, application of a mustard leaf over the pit of the stomach may be tried. If the hiccough persists, it would be advisable to call in the medical attendant.

HIGH-FREQUENCY CURRENT.—*See* ELECTRICAL TREATMENT.

HILL DIARRHŒA.—This is a tropical disease known also under the names of sprue, Ceylon sore mouth, etc. It is chiefly prevalent among Europeans visiting hilly districts of tropical countries after residence in the lowlands. The disease usually commences with slight attacks of sore mouth, indigestion and diarrhœa. The diarrhœa is usually worst in the morning and may be absent for the rest of the day. The patient's strength may become very undermined and signs of mental irritability arise. Treatment is largely dietetic, one form consisting of nothing but milk, and another consisting almost entirely of raw beef-juice. The sore mouth should be treated by mouth washes, such as glycerine and borax, or with 1 per cent carbolic acid in water.

HIP DISEASE.—This is usually a tuberculous condition and is more commonly known as "hip-joint disease." It is almost confined to delicate children. The symptoms start quite early in life and become more chronic as time goes on. The child complains of tiredness and is noticed to walk with a slight limp. The muscles gradually waste about the hip and the limb alters in appearance. The thigh is bent upwards while the foot is turned outwards, and there is usually a great deal of pain and limited movement. Treatment consists in complete rest, and various appliances may be used to keep the limb in normal position. The child should live in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the open air as much as possible. In cases that have gone too far for this treatment, operation may be necessary.

HIRSUTIES.—*See* HAIRINESS.

HOARSENESS.—This is not a disease itself but a symptom of such disorders as laryngitis, bronchitis, etc. If the throat is dry, secretion will be encouraged by sucking menthol and eucalyptus jujubes. If hoarseness persists over a month the larynx should always be examined by a specialist, as the condition may be serious.

HOBNAIL LIVER.—*See* CIRRHOSIS OF THE LIVER.

HODGKIN'S DISEASE.—This is a rare condition and consists of an enlargement of lymphatic glands, together with anæmia; in many cases there is also enlargement of the spleen and liver. The cause of this condition is not known, and there is no known treatment which has any certain effect in stopping the process of the disease. The drugs which have given the best results are arsenic and phosphorus. X-rays have also been used.

HOLLOW FOOT.—*See* CLUB-FOOT.

HOOKWORM DISEASE.—*See* MINER'S ANÆMIA.

HOSPITAL SORE THROAT. — An epidemic, infectious sore throat which may run through the wards of a hospital. The best treatment is to paint the throat with tincture of iodine in the early stages.

HOT-AIR BATHS.—*See* BATHS.

HOT PACK.—*See* WET PACK.

HOUSEMAID'S KNEE.—A bursitis of the knee.

"HUMP-BACK." — *See* SPINAL CURVATURE, ANGULAR.

HYDATID CYST.—*See* CYSTS.

HYDROCELE. — This means an accumulation of liquid in the scrotum, the pouch which contains the testicles. It is found to be more common in middle-aged persons, especially those who have lived in hot climates. The swelling varies with the amount of fluid, but it is generally quite elastic in feeling. The scrotum should be supported by a suspensory bandage; by this means the accumulation of fluid may be prevented.

If the accumulation of fluid is so large as to cause discomfort, the swelling may have to be tapped. If, however, after repeated tappings the fluid still continues to accumulate, an operation may be necessary.

HYDROCEPHALUS. — Hydrocephalus, or water on the brain, occurs most frequently in children. It may be present before birth or develop after birth, or may be a sequel to meningitis. In some cases it is a manifestation of congenital syphilis. It may also come on later in life, as the result of the pressure of a tumour interfering with the flow of blood away from the brain. The pressure of the fluid on the brain usually affects the mental condition of the patient, but mild cases are often very intelligent.

HYDROCHLORIC-ACID POISONING. —The symptoms are those of a corrosive poisoning. No emetic should be given. Intense burning pain is felt in the mouth, throat and stomach, and the skin may turn cold and clammy. The acid leaves white stains on the mouth and throat. Milk, magnesia or lime water should be given in small doses at frequent intervals.

HYDROCYANIC-ACID POISONING. —*See* PRUSSIC-ACID POISONING.

HYDRONEPHROSIS.—This condition is due to a blocking in the urinary passages below the kidney which causes distension of the kidney with urine. It may be due to a stone obstructing the ureter, to enlarged prostate, or to the pressure of abdominal tumours. Treatment consists in removing the obstruction.

HYDROPATHY.—A medical cure by water.

HYDROPHOBIA.—Rabies is another term for this disease. It is communicated to man through the bite of an infected animal, usually a dog. Since the enforcement of the Muzzling Order, hydrophobia has vanished from Great Britain, although previous to that it was not uncommon. The disease is due to a germ which is conveyed through the saliva. The symptoms do not arise for some considerable time after the bite—usually about six weeks, but the time may vary from ten days to six months. The wound, which has usually healed up, begins to look red and irritable and the patient becomes very depressed and restless. In a few days the depression may give way to excitement and wildness. The patient finds pain and difficulty in swallowing and the sight of water may cause violent spasms and contractions of the muscles of the throat; hence the name hydrophobia ("fear of water"). This stage lasts about three days, and the patient is usually in a very distressed condition. In the following stage the patient becomes paralysed and comatose, and death may occur within a few hours.

Treatment.—When a person is bitten by an infected animal the wound should be vigorously sucked, care being taken to cleanse the mouth with an antiseptic lotion as soon as possible. The patient should be sent for treatment originated by Pasteur in 1885. This treatment consists in inoculating the patient until he becomes immune to the full strength of the virus. This treatment has been the means of saving thousands of lives, and there are now Pasteur Institutes in most countries, where treatment can be carried out under modern conditions.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HYDROTHERAPY.—The treatment of disease by water.

HYPERPIESIS.—High blood-pressure.

HYPERPYREXIA.—Very high fever.

HYPNOTIC. — A drug that causes sleep. (*See* NARCOTICS AND HYPNOTICS.)

HYPNOTISM.—Treatment by hypnotism or "suggestion" has been employed with excellent results in many conditions, especially in the following types: neurasthenia, hysteria, drug-habits, stammering, obsessions and many other neurotic conditions. One of the most remarkable effects of hypnotism is the production of anæsthesia, and some doctors employed this method before the days of chloroform. The value of treatment by suggestion is becoming more and more recognized as a branch of medicine.

HYPOCHONDRIASIS.—This is a state of mental depression into which the patient allows himself to fall, owing to worry about his health. It is a state of mind occurring among people who have too little work to occupy their attention. Patients' whole life is given up to thinking about their ailments and some cases may pass into definite melancholia. In the treatment of this condition the personality of the doctor counts for a great deal. Effort should be made to get the patient's mind occupied with some hobby; he should be made to take as much exercise as possible, and care should be taken to keep all medical literature out of his hands.

HYSTERIA is a nervous disorder, in which emotional states control the body, most commonly occurring among young women but not unknown among men and boys. It is characterized chiefly by lack of self-control, desire for notice, exaggeration of the feelings, and capriciousness. Almost any symptom of almost any disease may be imitated by hysteria, such as spasms, choking, loss of sense perception (blindness, deafness), fainting, paralysis, loss of voice and complaint of tender and painful areas on different parts of the body. Many cases are known of self-inflicted wounds in hysterical persons, done to elicit sympathy. In diagnosing hysteria from genuine disease the chief points are that although the person may fall in a faint or be seized with convulsions she does not bite her tongue or hurt herself, and has an attack only when other people are present; self-inflicted wounds are usually on the left side of the face or left hand or legs, i.e. places which can be easily reached by the hysterical person herself. But it may be difficult even for an expert doctor to say whether an individual is hysterical or not, at least until she has been for a time under careful observation. While a fit of hysterics may be cured for the time being by the time-honoured treatment of a douche of cold water (a soda-water syphon has been known to come in handy), it is probably better, to obtain a lasting cure, to explain kindly and sympathetically, yet firmly, to the patient that her symptoms have no basis in organic disease but are entirely functional and curable and will disappear when she begins to realize this. The hysterical person is usually very susceptible to treatment by hypnotism, but this is a remedy to be used only by experienced doctors and with discretion. Suggestion and auto-suggestion are remedies of similar type which are more generally valuable than hypnotism; certainly the patient's mind's eye must be turned from within outwards, usually with the aid of new interests or a new occupation.

IDIOCY.—A condition of mental deficiency which is usually accompanied by physical defects. The defect in the brain may be present at birth, or it may occur later in life through disease or injury. The degree of mental backwardness varies very considerably: in some cases it merely amounts to the individual appearing slightly stupid, while in other cases it may be so apparent as to render the child quite incapable of being educated at all. Teaching of self-control and the observance of all the rules of bodily health should be persevered with from early childhood. If the child is at all educable, institutional training is advisable so that the child may have a chance of happiness among children of its own standard.

ILLUSIONS.—False interpretations by the mind of something real.

IMBECILITY. — Mental weakness, similar to idiocy, but of a less degree.

IMMUNITY.—Immunity is a state of the body wherein it resists the development of disease. This state may be acquired through a person having had a disease, and so becoming insusceptible to a second dose of infection, or artificially by means of inoculation with the germ or its poisons. There is such a thing as a natural immunity to infectious disease, either racial or individual. Man is very often immune to certain diseases in animals, and it is a well-known fact that two persons exposed to the same amount of infection may not react in the same way. The substances used to produce active immunity are called vaccines, active, because the body manufactures its own antibodies, which act as antidotes. In the passive form of immunity the antibodies are furnished by serums taken from the blood of animals that have been immunized by repeated injections of the disease germ. This branch of medicine has grown extensively in the last few years and has achieved some amazing results in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

diphtheria, smallpox, typhoid, cholera and many other diseases.

IMPACTED FRACTURES. — *See* FRACTURES.

IMPERFORATE ANUS. (*See* ANUS, IMPERFORATE.)

IMPETIGO.—An acute inflammatory disease of the skin, characterized by small red spots on which blisters appear. These blisters become filled with pus, and then break, discharging a fluid which quickly dries and forms into scabs. This condition is usually attended by a great deal of irritation, and re-inoculation often occurs through scratching the blisters or crusts with the finger-nails. As the disease is very contagious, care should be taken with the clothes, etc., worn by the patient.

Treatment.—The crusts must first be removed, and this can be made easier by applying carbolized oil or a weak carbolic lotion, 1 in 100. After removal, the parts should be painted with gentian violet. Ill-nourished children should be given cod-liver oil, and for adults tonics such as quinine are suitable. Penicillin cream has been used with great success.

INCONTINENCE OF URINE. — *See* BED-WETTING; URINE, INCONTINENCE OF.

INCUBATION PERIODS.—The time which elapses between the introduction of a germ into the body and the onset of symptoms is known as the incubation period. The average incubation periods of the more common fevers are as follows:—

Disease	Incubation Period Days
Chicken-pox	10–16
Diphtheria	2–4
Erysipelas	1–3
German Measles	14–17
Influenza	1–5
Measles	10–14
Mumps	18-21
Relapsing Fever	2–10
Scarlet Fever	2–3
Smallpox	12–14
Typhoid	10–21
Whooping Cough	10–16

INDIGESTION.—Indigestion or dyspepsia is always a sign of some disturbance of the digestive function. It may be due to the eating of some irritating food, fried foods, hot bread, nuts, spices, too much fat, too much alcohol or imperfectly masticated food; also food that is too hot or too cold. Other causes may be irregular hours of eating, self-starvation, inadequate exercise and lack of fresh air, diabetes, infectious diseases or renal disease. Nervous influences, such as worry and overwork, or the abuse of alcohol or drugs, are closely associated with indigestion. Organic dyspepsia may be caused by gastric and duodenal ulcer, gastritis, cirrhosis or sclerosis of the stomach or cancer of the stomach. The symptoms are sense of fullness or weight in the stomach, flatulence, heartburn, vomiting, headache, coated tongue and fetid breath, mental depression and usually constipation. In patients over forty years of age, a very thorough medical examination is advised.

Treatment.—Effort should be made to find out the direct cause, and unless it is the result of some serious organic disease treatment should not prove to be very difficult. Constipation, if present, must be attended to and, although medicines may have to be taken at first, it would be more beneficial to rely solely on the right sort of food and exercise (*see* CONSTIPATION). The diet must be of the plainest, containing nothing but easily digested substances.

All irritating foods must be avoided, also pastry and preserves and jams and twice-cooked meats. Milk may be taken either hot or cold, and it would be a very excellent thing to keep on a milk diet for a day or two after an attack of dyspepsia. Plenty of fresh air should be taken and enough exercise to stimulate, but not fatigue, the body. Alcohol should be avoided as much as possible, but a little good sherry or diluted whisky may be taken with meals; tobacco should be used in moderation. Drugs which are useful when indigestion is due to too much acidity are bicarbonate of soda, bismuth, rhubarb, nux vomica. Where there is a deficiency of acid in the stomach dilute hydrochloric acid may be taken.

INFANT, CARE OF THE NEW-BORN.—After the child is born its eyes require immediate attention. They should be carefully wiped out with swabs of cotton-wool soaked in a weak warm lotion of bicarbonate of soda or boracic acid. The mouth and throat must also be swabbed out. When the child has begun to breathe naturally, the navel cord must be tied. This is usually done as follows: Lengths of strong thread are cut one foot long; three of these lengths form a ligature which is tied tightly round the cord about an inch and a half from the child. Another similar ligature is tied an inch farther off and the cord is cut through with scissors between the two ligatures. After the baby has had its first bath, which usually takes place as soon as the after-birth has passed and the mother has been left comfortable, the stump is dried and dusted with boracic powder, and a hole is cut in a piece of clean linen and the end of the cord is pulled through it. The binder of flannel is then wound round the baby over the stump. The child is then wrapped in a warm blanket with its hands placed inside so that it cannot reach its

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

eyes to rub them, and is put aside until the mother can be left.

INFANTS, HYGIENE OF.—A daily bath is necessary. This may be given in the morning or evening, to suit the convenience of the mother. A bath is sometimes recommended both night and morning, but complete immersion in water once a day is sufficient if the baby is sponged thoroughly on the lap each day as well. The temperature of the bath should not exceed 100° F., and a bath thermometer should be used to test it. If a thermometer is not obtainable the water should be tested with the elbow, and should feel only tepid to the touch. Water that feels warm to the hands of a grown-up person is far too hot for a small baby. When filling the bath, always make a habit of putting in the cold water first and bringing to the required heat by adding hot water. If this were always done there would be fewer scalding accidents. The child should be allowed to exercise its limbs for a short period every day. While the bath is being prepared the child should be laid on a blanket, free of clothing and out of the way of all draughts, and encouraged to stretch and kick its limbs about. The bedroom where the child sleeps should be warm but well ventilated, and if the house has a garden the child should have its morning sleep outside when the weather is at all suitable. As the child grows older it should be encouraged to run about and amuse itself. The clothing should be always warm enough, but over-clothing should be avoided. The midday sleep should always be continued until the child is about four years of age; in fact, children should have as much sleep as they want. If the child objects to resting during the day, it is usually better to allow it to play quietly by itself, especially if there are other children to be put to sleep. Care should be taken to change any damp clothing immediately, as this is an evil which may lead to complications.

INFANT FEEDING.—During the first day of life, before the mother has recovered from her confinement and her flow of milk is established, the baby can be put at the breast for a few minutes only, in order to accustom it to sucking, and it may be given little sips of warm boiled water with sugar in it from a small teaspoon. By the third day the milk should be established and the baby able to suck. It should then be put to the breast every four hours from 6 a.m. to 10 p.m. The baby may be nursed until it is satisfied, goes to sleep or stops suckling, but it should never be kept at the breast more than twenty minutes even if the baby does not appear satisfied. If the milk supply is adequate it must learn to take all it needs in this time; if insufficient, a supplementary bottle of diluted milk must be added. The baby, unless premature, or for special reasons, for example, if weakly, should not be fed during the night.

For artificially fed babies, a prepared dried milk is most satisfactory, or a reliable cow's milk (tuberculin tested or pasteurized), dilute according to age, if preferred. Scrupulous cleanliness is needed with the preparing of bottles, as lack of this, and the pest of flies, so often causes gastro-enteritis.

Between the fourth and fifth months, solid feeding should be started. This takes the form of giving a few spoonfuls of some easily digested starch, such as groats, before the 10 a.m. feed, and in another three weeks a little bone broth or vegetable purée can be given before the 2 p.m. feed. By seven months the baby should be having solids three times daily in addition to its milk. If the breast milk is inadequate dried milk or cow's milk may be given from a cup or spoon. The baby should be completely off the breast by the eighth month (*see* WEANING).

After nine months the baby should be having fruit juice daily; three other meals containing cereal, broth, vegetables, coddled egg, steamed fish, milk pudding, fruit pulp, hard crusts or rusks to bite; and its milk to drink. Some babies cut themselves off from their 10 p.m. feed at an early date; others need it for a longer period.

The principle of adding new items to the diet must be that of giving one fresh thing at a time, and that to the extent of one or two teaspoonfuls until it is established that the child can digest it. If it cannot, it should be withheld until a later period, and may even have to be discontinued completely should a genuine idiosyncrasy against it be present. A little offal, such as mashed brain, chopped liver or tripe, can safely be given before a year, and not long afterwards shredded rabbit or meat can be started.

Eggs should always be coddled (placed in boiling water, removed from heat and left ten minutes). Vitamins are essential for the child's normal growth, so cod- and halibut-liver oil must be given from the first month. Orange juice, black currant purée or rose hip syrup must be given daily. From the beginning babies should be given water to drink. Food should be carefully cooked unspiced, and meals should be regular. The toddler should be encouraged to feed itself to establish independence. Each child is an individual in its ability to partake and digest, so the mother's judgment and good sense must accompany the patient firmness which is needed in this preparation for healthy life.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

INFANTILE CHOLERA. — *See* EPIDEMIC DIARRHŒA.

INFANTILE PARALYSIS.—This is medically termed anterior poliomyelitis. It is commonest in young children, but adults may also be affected. It is known to be due to a living virus, and the infective agent is present in the brain and spinal cord, in the naso-pharyngeal secretions and in the blood. The incubation period is from three to ten days. The general symptoms are stiffness of the neck, paralysis and slight fever. Usually the paralysis lessens after a few days, but this improvement merely lasts for a short time: progress is then slow and may continue for two to three months. There are many forms of poliomyelitis and the complexity of the symptoms sometimes makes the diagnosis difficult. The patient should be isolated and, as the disease is very contagious, care should be taken of all the articles used by the patient: especial care should be taken of the nasal and pharyngeal discharges.

Treatment.—The condition is a serious one requiring the attention of a doctor. The limbs involved should be placed in the most relaxed position and all movement must be avoided for some weeks. Careful massage may be carried out, and electrical treatment may prove beneficial in keeping up the nutrition of the muscles. Fatigue should be guarded against for many months.

INFANTILISM.—A general retardation of development, bodily and mentally.

INFECTIOUS DISEASE. — *See* NOTIFICATION OF DISEASES.

INFLAMMATION is the succession of changes which occur in the living tissues when they are injured, so long as the injury does not kill the tissue. Injuries include burns, cuts, blows, a foreign body, invasion by bacteria. Local signs are pain, heat, redness, swelling and sometimes impairment and loss of function. There may also be general symptoms, malaise and fever.

Treatment.—In cases where the cause can be removed, such as a splinter or stone in the bladder, this must be done. Cuts must be dressed, burns treated, boils fomented. Heat is often comforting and assists in stimulating the circulation. Apart from this local treatment, bacterial infection needs vaccine, anti-toxin or serum injections, sulphonamides or penicillin.

INFLAMMATION OF THE BLADDER.—*See* CYSTITIS.

INFLAMMATION OF THE BRAIN.—*See* ENCEPHALITIS LETHARGICA; MENINGITIS, SUPPERATIVE.

INFLAMMATION OF THE STOMACH.—*See* GASTRITIS.

INFLAMMATION OF THE VEINS.—*See* PHLEBITIS.

INFLUENZA.—Influenza is a feverish disease caused by invasion of the system by germs. It occurs with great regularity in outbreaks every eight or nine months. Some of these outbreaks, especially in warm fine weather, are so slight as to pass unnoticed: others, however, cause a great deal of ill-health and loss of work. Occasionally, moreover, there occurs an epidemic which is so devastating that an enormous number of people die in many countries. The last of these terrible epidemics was in 1918, when more damage is said to have been done to life and health by the influenza epidemic than by the First World War. Each epidemic differs from the others in character. Sometimes the type is catarrhal—with symptoms chiefly in the ears, nose and throat; or it may be pneumonic—with a tendency to develop into pneumonia or broncho-pneumonia; a third type is gastro-intestinal. There is another form which is not so easily recognizable as influenza, in which there is great debility and mental depression but little or no fever.

A germ has been isolated and called the influenza bacillus, but it is not certain whether this germ is the cause of the disease or whether it is responsible only in conjunction with other bacteria.

The treatment of a slight case of influenza is simple. As soon as a person suspects that he has caught influenza he must go home and go to bed. Rest in bed, warmth, liquid food in plenty and two aspirin tablets every four hours will cure most early cases of influenza in a couple of days.

After leaving bed the patient should take a tonic, and care must be taken of the health for a time in order to avoid a re-infection and complications. If the patient is obviously more ill than is usual with a simple influenza, send for the doctor before worse befalls, and remember that the person who mixes with his fellow men when he has influenza is a criminal danger to the public. The occupants of the next seats to him in the bus may not get off so easily. They may die of pneumonia, or drag through the remainder of their lives with crippled hearts.

INGROWING TOENAIL.—*See* NAILS, DISEASES OF.

INGUINAL HERNIA.—*See* RUPTURE.

INHALATIONS.—Medicinal substances which are breathed in. They are used extensively to clear the nose and bronchial tubes in cases of bronchitis. When the nose is blocked with catarrh, great relief may be found in inhaling the steam from a jug of boiling water into which has been put a little friar's balsam or menthol crystals.

INJECTIONS, HYPODERMIC. — Injections under the skin by means of a syringe discharging through a needle.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

INJURIES.—*See* FRACTURES; WOUNDS.

INSANITY.—A mental disorder that arises with or without loss of will and of consciousness. In insanity, as opposed to mental deficiency, the mental faculties have attained their normal development before becoming deranged. It is characterized by a variety of symptoms, the most common of which are change of character and of habits, moroseness, confusion, elation, melancholia, mania, delusions and hallucinations.

Very little is known about the cause of insanity. Heredity plays the chief part, and the more unstable the mentality of the parents the more likely are the children to suffer from some form of mental disorder or even to be mentally defective. People with a predisposition to mental instability may be normal until some physiological stress such as puberty, adolescence, childbirth (puerperal insanity) or the climacteric proves too much for them. It may be precipated by other causes, such as chronic sepsis, shock or worry.

Melancholia.—A condition where there is profound emotional depression with a tendency to introspection, with or without delusions. The patient will cry and shed tears for hours at a time for no apparent reason. He feels miserable and unhappy and may develop suicidal tendencies.

Mania.—The opposite of melancholia. Here there is great mental and emotional excitement with delusions, hallucinations and physical excitement. There may be tendencies towards violence. The special senses such as sight and hearing may be far more acute than normal. It is recorded that a patient suffering from mania complained that the bells of a certain church were deafening him, whereas they could be heard only with the greatest difficulty by the medical and nursing staff present at the time.

Delusional Insanity.—A delusion is a judgment which cannot be accepted by people of the same class, education, race and period of life as the person who expresses it. A delusion is not by itself a sign of insanity, e.g. some people think that the number 13 is unlucky, others think the reverse. One of these groups is suffering from a delusion, but is not accounted as insane on this account.

Dementia may be due to chronic sepsis, such as alcohol, arterial diseases, etc., and senile changes. Loss of memory, poor voluntary attention, lack of coherence in trains of thought are among the most prominent symptoms.

Recurrent insanity is that condition in which there are attacks of mental disorder with intervening lucid intervals. It is during these lucid intervals that the patient is often discharged from the asylum and while at large he may appear quite normal. It is in this type of insanity that voluntary sterilization might be of practical value, as during these intervals the patient returns to his wife and may procreate children who are liable to have the mental taint of their parent.

INSOMNIA. — Inability to sleep. In some cases this is due to such simple things as cold or hunger, or the partaking of stimulants such as alcohol, strong tea or coffee immediately before retiring. Other cases of insomnia include those suffering from great mental strain or shock. The diseased condition of the blood-vessels of the brain is responsible for the broken sleep from which so many old people suffer.

Treatment.—If indigestion is the cause of insomnia, the last meal of the day should be eaten not less than four hours before bedtime. On the other hand, if exhaustion is the cause, a little light refreshment, especially hot milk—or any milk food—should be taken before going to bed. In the case of mental strain the patient is advised to go for a brisk walk before retiring, and a little light reading very often induces sleep. In the case of cold, a hot-water bottle placed at the feet, or an electric pad or blanket, will induce comfort and probably sleep. The habit of lying in bed and thinking must be checked as much as possible; here the much-abused repetition of numbers or the saying over and over of some lines of poetry without attending to their meaning will do much to quieten the activity of the mind. Drugs should not be taken unless under medical supervision, but a little bromide or aspirin may be taken if the sleeplessness persists.

INSULIN.—A substance found in the pancreas; it is used in cases of diabetes for holding the disease in check.

INTERCOSTAL NEURALGIA or neuralgia of the ribs develops three main tender points: one near the spine, one at the side in line with the middle of the armpit, and one at the side of the breast bone. Menthol ointment may be rubbed in, but the best cure is usually a holiday. (*See* NEURALGIA.)

INTERNAL SECRETIONS. — See GLANDS

INTERSTITIAL KERATITIS. — *See* KERATITIS.

INTERTRIGO.—An eruption of the skin due to friction of adjacent parts of the body. (*See* CHAFING.)

INTESTINAL OBSTRUCTION.—*See* BOWELS, OBSTRUCTION OF.

INTESTINES.—Another name for the bowels.

INTUSSUSCEPTION. — *See* BOWELS, OBSTRUCTION OF.

INUNCTION.—The act of rubbing an

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

oily or fatty substance into the skin; also the substance used. (*See* OINTMENT.)

IRITIS.—Inflammation of the iris, the coloured part of the eye. The symptoms are neuralgic pain and intolerance of light. The eyeball is usually tender on pressure, the pupil becomes irregular in shape and there may be some dimness of vision. There is always a good deal of inflammation round the cornea. The patient should rest in bed in a darkened room and atropine drops should be administered. As the condition may be a serious one the doctor should be called in.

IRRITANT POISONS.—*See* POISONS AND POISONING.

ITCH.—The "itch," or scabies as this affection is popularly named, is a skin disease caused by the presence of a small animal parasite, the *Acarus scabiei*. It burrows into the skin, especially between the fingers and toes, the backs of the hands, and various parts of the sexual organs. The female acarus may live comfortably in her burrow for as long as two months, depositing anything up to about fifty eggs. The itching, which is usually worst at night, leads to incessant scratching, and inflammation and pimples may be provoked in this way. Very often, in fact, this scratching gives rise to an eczematous condition which may mask the original affection.

Treatment.—For this complaint, sulphur has been superseded by benzyl-benzoate. Any treatment, however, must be repeated for three successive days and must be accompanied by the fumigation of all bed-clothes and clothing. In slight and recently contracted cases treatment can be carried out at home, and consists of rubbing the preparation well into all the affected parts, but in the cases of longer standing or greater severity adequate treatment is better obtained through the local authority's cleansing station.

ITCHING.—This complaint may vary from a slight feeling of discomfort to a most maddening and intolerable sensation. The condition may be due to such affections as diabetes, Bright's disease, jaundice, or rheumatism. Local pruritus, or itching, occurs very often on the palms of the hands or the soles of the feet; this is met with in rheumaticky people. The external female organs may be made irritable from some discharge resulting from a disorder of the internal organs.

Treatment.—When the itching is due to an underlying disorder, a cure may not be obtained until the disease is recognized and treated. The use of coal-tar soap instead of ordinary soap is to be recommended. In old people the skin may become irritable through loss of natural fat; this is best relieved by application of a little petroleum jelly or a prepared cream. To avoid further irritation, silk should now be worn next to the skin instead of wool or flannel. Hot baths, or bathing the affected parts with hot water, very often affords relief.

JACKSONIAN EPILEPSY.—The form of epilepsy in which localized convulsions occur usually without loss of consciousness. This condition was named after Hughlings Jackson, a famous English neurologist.

JAUNDICE.—This term is applied to a yellow discoloration of the skin due to the presence of bile in the blood. It is not really a disease in itself, but merely a symptom of various conditions. The chief causes of obstructive jaundice are: obstruction within the bile ducts by gallstones; inflammation of the mucous membrane which lines the liver-ducts; tumours closing the orifice of the duct or growing in its interior; pressure of a tumour or the pregnant uterus. Other causes may be mental shock or any nervous disturbance.

Symptoms.—The colour of the skin and the whites of the eyes range from a pale yellow to a deep olive green; in some cases the skin takes a greenish-black tint which gives rise to the name "black jaundice." The patient usually sweats considerably and there may be itching and boils. The urine is coloured with bile-pigment, also the sweat, and sometimes the tears, saliva and milk. Coloration of the urine may show before it makes its appearance on the skin or eyes. No bile passes into the intestine; the stools are of a pale, drab, slate-grey colour, and are particularly offensive. In some cases the patient is constipated, but diarrhœa may occur owing to decomposition. The pulse slows down and the patient usually shows signs of depression or drowsiness. It should be remembered that in some cases of jaundice, the blood-coagulation time is retarded; this is an important factor in operative cases.

Treatment.—In cases where the obstruction can be removed, this must, of course, be treated. For the jaundice itself, little can be done—but the irritation of the skin may be relieved by sponging the skin with a solution of sodium bicarbonate (1-2 per cent), or the application of 5 per cent menthol ointment. Any constipation may be relieved by giving a grain or two of calomel at night. All fatty substances should be eliminated from the diet; peptonized milk, or milk and soda water, may be taken in quantity, and beef tea and chicken and toasted bread, etc., should furnish the bulk of the diet. The administration of calcium salts or the injection of blood serum is advisable before operation.

JEJUNUM.—The second portion of the small intestine, extending from the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

duodenum to the ileum. It is about 8 ft. in length.

JOINTS.—*See* BONES AND JOINTS.

KALA-AZAR.—This is a fever occurring in warm climates due to a parasite, the Leishman-Donovan germ. Dysentery is a very frequent complication of this disease. The course of the disease varies from a few months to two years. Antimony, especially if given early, may be of great benefit to the patient.

KERATITIS. — Inflammation of the cornea, the transparent layer in front of the coloured part of the eye.

KIDNEY.—*See* URINARY ORGANS.

KIDNEY, STONE IN.—*See* STONE IN THE KIDNEY.

KIDNEYS, INFLAMMATION OF.—*See* BRIGHT'S DISEASE.

KNOCK-KNEE.—The medical term for this affection is genu valgum. It may be the result of rickets in children or may be induced by bad habits of standing or walking. If the defect is noticed in time, manipulation and massage may do much to correct the fault. The child should be well nourished and cod-liver oil must be given. A splint or knee-brace should be worn in more advanced cases, and operation may be necessary if the deformity does not yield to treatment.

KYPHOSIS. — *See* SPINAL CURVATURE, ANGULAR.

LABOUR. — Parturition, the bringing forth of young. Labour is divided into three stages and the whole process usually takes anything up to twenty-four hours in a primigravida, or woman bearing her first child. The first stage, which lasts about eighteen hours, is devoted to the dilatation of the neck of the womb ready for the passage of the child. This is characterized by the "pains" (*see* CHILDBIRTH), and the end of the stage is marked by the bursting of the membranes surrounding the child and the discharge of a certain amount of water. Then follows the second stage, or stage of the expulsion of the child, which ends with its birth. It lasts from one to three hours. There is then usually a lull for five to fifteen minutes, when the third stage begins, the pains return, and the afterbirth is expelled. The confinement is then complete.

In the first stage the woman is better up and moving about. She may take fluid nourishment, and would be wise to take a dose of castor oil or have an enema. With the beginning of the second stage the patient goes to bed, and can help herself by "bearing down" during the pains. The doctor or midwife will now be in attendance and the patient may have the alleviation of chloroform. It is now possible to obtain chloroform in the form of capsules containing small amounts, which can be used by the patient herself. In the last stage of the confinement, the chief trouble may be excessive bleeding, which may be dangerous if not stopped.

Normally the head of the baby is presented first. If any other part comes first the presentation is called abnormal and there may be trouble with the delivery, or on the other hand all may go smoothly. When the wrong position is detected beforehand the child can usually be turned in the womb before the confinement. If for some reason the child cannot be born by the usual channel, the operation of cæsarean section is done. There is no condition in which so many dangers can be avoided beforehand as in childbirth, and every pregnant woman should see that she is properly examined at intervals during the pregnancy either by her own doctor or at an ante-natal clinic.

LACTATION.—*See* SUCKLING.

LARDACEOUS DISEASE. — Another name for this condition is amyloid disease. It means a degeneration of the organs of the body. It may be the result of syphilis or of some other disease. It cannot be treated as a direct disease but must be treated through the disease which causes it.

LARYNGISMUS STRIDULUS. — *See* CHILD-CROWING.

LARYNGITIS may be *acute* or *chronic*. *Acute laryngitis* comes on most commonly as a complication of the common cold and is apt to occur most frequently in singers and other professional voice-users. The most noticeable symptom is loss of voice. As regards treatment, the voice should not be used at all, cold compresses should be applied to the throat, and inhalations of friar's balsam (one teaspoonful in a pint of boiling water and the steam inhaled) used two or three times a day; aspirin tablets, one or two thrice daily, should also be taken. *Chronic laryngitis* is most commonly due to neglected acute laryngitis, the vocal cords becoming reddened and thickened and the voice husky; in singers the voice may crack quite unexpectedly. Complete rest for the voice is necessary, and the vocal cords may be painted with astringents —but this must be done by an expert laryngologist. It is a very important rule that every person who has been persistently hoarse for a month should have his larynx examined by a throat specialist; there may be nothing seriously wrong with the throat but, if this examination were made in every case, serious cases—such as cancer of the larynx—would be discovered at an early stage, when adequate treatment could be carried out. Everyone who is hoarse must not imagine that he has cancer of the larynx—it is not so common as all that—

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but it is one of the most curable forms of cancer when it is recognized at an early stage. Chronic hoarseness may also be due to "singer's nodes" caused by bad voice production, to nasal obstruction causing laryngitis, to paralysis of one of the vocal cords, to tuberculosis (in which case it is *always* secondary to tuberculosis of the lungs), and to various other causes.

LATERAL CURVATURE.—*See* SPINAL CURVATURE.

LATERAL SCLEROSIS.—This means a degenerative hardening of a part of the spinal cord. It usually affects people about middle life and the cause is not yet known. The gait becomes affected and the patient finds great difficulty in raising the foot so that he is continually stumbling over steps. The disease gradually affects even the upper limbs until the patient becomes bedridden. Little can be done in the way of treatment, except to try massage of the limbs.

LAUGHING GAS.—*See* ANÆSTHESIA.

LAXATIVE.—An aperient, a preparation for loosening the bowels. (*See* MEDICINES AND HOW THEY ARE MEASURED.)

LEAD POISONING. — Lead workers are always exposed to the risks of poisoning by inhalation of fumes or dust. Preventive measures in industry have brought about an enormous decrease of cases. Poisoning may also arise by drinking water which has run through leaden pipes, especially water coming from some upland peat-covered ground. The symptoms are constipation, muscular weakness and loss of appetite. As the disease develops there may be attacks of severe colic, and a blue line is visible round the edge of the gums and especially round the teeth, encrusted with tartar. Dyspepsia and anæmia may be present and the skin of the patient becomes grey and earthy looking. Muscular weakness is very marked, especially in the hands, due to neuritis; this often develops into complete paralysis and "wrist drop." Other symptoms are pain in the joints, headache, convulsions and development of a form of Bright's disease.

Treatment.—Prevention includes control of lead-laden dust, prohibition of feeding in workrooms, introduction of adequate washing facilities and strict insistence on personal cleanliness. All workers should take long drinks—very dilute sulphuric acid, orangeade or milk. In chronic cases of poisoning the lead must be immobilized first by large doses of calcium, and later excretion of it is promoted by a low calcium diet. Symptoms must be treated: heat and laudanum for colic; massage for paralysis.

LENS.—*See* EYE.

LENTIGO.—*See* FRECKLES.

LEPROSY.—This is a slowly developing, long-lasting disease which is one of the oldest diseases known to man. Throughout the Middle Ages leprosy was very prevalent in Europe, but Norway is now the only European country where it is at all common, although it is to be found in Iceland, Sweden and parts of Russia; it is considered to be a disease entirely of the East. The disease attacks persons of all ages, but infection is rare after the age of thirty and the youngest cases are rarely under three or four years of age. In 1874 Hansen, of Bergen, discovered the cause of the disease to be due to the bacillus lepræ, but no conclusive proof has been brought forward that leprosy may be contracted by inoculation. The bacilli are given off from open sores and may enter the body through the mucous membranes and by abrasions of the skin. There is every evidence that the disease may spread through handling infected clothing, and the eating of tainted fish is believed to be an important factor. There are two main forms of leprosy, the tubercular or nodular form, and the anæsthetic or nerve leprosy, and both types may occur in the same person. The earliest symptoms are attacks of feverishness, sweating and pains in the head and joints. These symptoms may go on for months or even a year or two before the typical eruption breaks out on the skin. The patches and spots are of a reddish-brown colour, and if they appear on a hairy part of the body the hair usually falls out or becomes white and downy. The nodular form of spot develops into a freely movable, rubber-like consistency. The spots are flat and about the size of a split-pea, although some grow much larger. When these nodules become numerous, they join together until large folds and masses of tissue are formed, giving rise to the lion-like face of leprosy. Later, changes occur and the spots soften and form into ulcers and hideous sores. The patient may live on for years in this repulsive fashion until mercifully released by exhaustion or some other complication.

In anæsthetic, or nerve, leprosy the nerve trunks are the seat of the nodules. There is severe neuralgic pain which later develops into numbness. The patches of skin become very dark in colour and there is loss of all sensation to touch or pain. There is wasting of the muscles, and fingers or toes may drop off. This type is more lasting than the nodular form, but the health usually gives way and the sufferer finds release from his misery.

Treatment.—Chaulmoogra oil is used extensively with very good results. X-rays and radium may do good to local lesions.

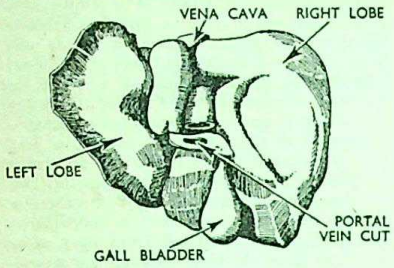
LEUCOCYTES.—The white corpuscles of the blood. (*See* BLOOD; LYMPH.)

LEUCODERMIA.—A disease of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

skin in which the natural pigment disappears, leaving whitish patches; it is also known as vitiligo. This disease is very common among dark-skinned races.



The Liver seen from below

LEUCORRHŒA.—This means the discharge of a whitish substance from the genital organs of the female. In children this may be due to dirt or worms. The parts should be washed and well bathed several times a day for a few days with a boracic solution. Whites, as this condition is commonly called, may be present in young women due to a catarrhal affection of the vagina. In married women the discharge may be from the vagina or from the womb. If the condition persists a doctor should be consulted. The parts should be kept perfectly clean and the bowels open.

LEUKÆMIA.—A disease of the blood in which the white cells increase in number. These short-lived cells are constantly being replenished, but over-production of them may be checked by arsenic.

LICE.—*See* PEDICULOSIS.

LICHEN PLANUS.—This skin disease is characterized by the appearance of large numbers of small flat-topped pimples of a pale or purplish tint. In most cases there is severe itching. Any part of the body may be affected, but usually the wrists, the back of the neck and the inside of the thighs are the favourite sites. It is believed to be due to nervous disorder. Internal doses of arsenic and mercury are advised and zinc ointment may be applied externally.

LIENTERIC DIARRHŒA.—A form of diarrhœa in which the food passes rapidly through the stomach without undergoing digestion. (*See* DIARRHŒA.)

LIGAMENTS.—*See* BONES AND JOINTS.

LIGHT TREATMENT. — *See* ELECTRICAL TREATMENT.

LINIMENTS.—Liniments are liquids intended for application to the skin by rubbing. They are used to relieve pain or to remove stiffness. The following are the names of a few liniments: camphorated oil, tincture of green soap, belladonna, and liniment of turpentine and acetic acid.

LINSEED POULTICES.—*See* POULTICES.

LIPOMA. — A fatty tumour. *See* TUMOURS.

LIPS, CHAPPED. — *See* CHAPPED HANDS AND LIPS.

LIVER.—The largest gland in the body, situated on the right side of the abdominal cavity. Its functions include the secretion of bile and formation of a large quantity of urea. (*See* DIGESTION.)

LIVER ABSCESS.—This condition is usually associated with the amœbic form of dysentery. Treatment consists of opening the abscess and draining it by means of a rubber tube. This condition is usually found in warm climates.

LIVER, GIN-DRINKER'S. — *See* CIRRHOSIS OF THE LIVER.

LIVER, INFLAMMATION OF.—*See* CIRRHOSIS OF THE LIVER.

LIVER SPOTS. — These are brown patches which appear on the skin, usually due to dyspepsia, and are very marked during menstruation or pregnancy. They may appear on any part of the body, but the patches most often come on the forehead and cheeks. The medical term for this complaint is chloasma. Treatment is unsatisfactory.

LIVER, TROPICAL.—*See* TROPICAL LIVER.

LOBAR PNEUMONIA. — *See* PNEUMONIA.

LOBULAR PNEUMONIA. — *See* BRONCHO-PNEUMONIA.

LOCKJAW.—Lockjaw, or tetanus, is due to the tetanus bacillus which enters the body and sets up a condition in which the muscles become rigid and the jaw locked. The germ is to be found in soil and usually gains entrance to the body through an abrasion of the skin. The first symptom is usually some rigidity or stiffness in the muscles of the neck and jaw, and the patient finds himself unable to open his mouth. The rigidity may spread to all the muscles of the body, and spasmodic contractions may occur.

Treatment.—The most efficacious treatment is the injection of tetanus antitoxin, which should be carried out as early as possible. It is important that the patient should be kept as quiet as possible and he should lie in a darkened room. Any loud sounds or bright lights may provoke a spasm which is absolute torture to the patient. Sedatives may be administered to diminish the severity of the convulsions.

LOCOMOTOR ATAXY.—This condition is also called *tabes dorsalis*, and it is a chronic disease of the nervous system, probably more common in men than in women. It is usually the remote result of syphilis (the onset of locomotor ataxy may

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

not occur until about ten years after the contraction of syphilis). The chief symptom is the peculiarity of the gait; the patient is inclined to throw his legs too far forward and the soles of the feet are brought down with a stamp, as the patient has lost all the sensation in his feet, and cannot tell when his foot touches the ground. There may be severe shooting pains down the thighs, which may be mistaken for rheumatism or neuralgia. The skin may be extremely sensitive so that the patient is unable to bear the slightest touch. There may be attacks of pain in the stomach, accompanied by severe vomiting; this stage is known as the "gastric crisis." Similar crises may occur in the bladder or in the rectum. Blindness from atrophy of the optic nerve may arise, and the bladder often gives rise to trouble.

Treatment.—Salvarsan and mercury may be administered, but the chance of recovery is very remote. Tonics and a nutritious diet should be given; exercises under medical supervision may be carried out in order to re-educate the muscles of the limbs.

LONG SIGHT.—*See* SIGHT, DEFECTS OF.

LOTIONS.—Lotions are substances of a watery character which are applied to parts of the body on lint or gauze.

LUMBAGO.—In this affection, pain and stiffness are felt in the muscles of the small of the back. Men are more liable to attacks than women, and onset may occur after exposure to cold or wet. Any bending or turning may be extremely painful; in fact, even slight movement should be avoided.

Treatment.—If the pain is at all severe, the patient should take to bed and hot-water bottles should be placed on the back or a hot pack applied. Massage or vigorous rubbing with turpentine liniment may relieve the pain. Turkish baths are very good in slight cases and two five-grain tablets of aspirin should be taken. The bowels should be kept open. (*See* RHEUMATISM (MUSCULAR).)

LUNGS.—*See* RESPIRATION.

LUNGS, CONGESTION OF. — *See* PNEUMONIA.

LUNGS, INFLAMMATION OF.—*See* BRONCHO-PNEUMONIA; PNEUMONIA.

LUNGS, TUBERCULOSIS OF.—*See* TUBERCULOSIS.

LUPUS ERYTHEMATOSUS.—This is an inflammatory affection of the skin in which red, rounded patches or a grey scaly condition may appear, or a mixture of both may occur. The face, neck, hands and feet are most often attacked. The patches commonly affect an area rather like a butterfly in shape, and the course of the disease may run on for as long as twenty years.

Treatment.—Electricity or X-rays may be tried and vaccine treatment may prove beneficial. Greasy ointments should be avoided, as they only tend to aggravate the condition.

LUPUS VULGARIS.—This affection is now known to be tuberculosis of the skin. It first appears as small swellings, reddish-brown in colour and rather like apple-jelly nodules. Lupus very often commences in the mucous membranes of the nose, and the condition may spread to the face and other parts of the body. If left untreated, ulceration may commence and the disease may gradually eat away the skin and underlying tissues, often causing great disfiguration.

Treatment.—Treatment by some form of light is very satisfactory. Finsen light is the method usually adopted, but some cases may call for X-ray treatment as well. Freezing by carbonic-acid snow has also been tried. Injections of tuberculin may prove beneficial. The patient should be put on a very nourishing diet and cod-liver oil should be given. Abundance of fresh air is necessary.

LYING-IN PERIOD. — The lying-in period, or puerperium, is a time of restoration for the mother, during which the womb or uterus shrinks to its normal size and position, and the breasts establish full secretion.

After the delivery is finished the vulva should be covered with a sterile pad, an abdominal binder applied and a warm sugared drink given. Unless hæmorrhage has been severe or there is any shock, such as may follow a complicated delivery, the mother should be propped up in bed. After the first two days she should be encouraged to move about in the bed, turning over, and the nurse or midwife will suggest simple appropriate exercises. A succession of visitors during the first days is too exciting and the breast flow may be inhibited, so moderation in this respect must be the rule. Nobody with a cold, or suffering from an infectious complaint, should be allowed as a visitor. After a week the patient may be allowed to sit on the edge of the bed while her bed is made, and in ten days she should be up. She should not be expected to resume all her household duties in full for three weeks, and her return to household routine and to her new responsibilities must be gradual.

Binders.—A linen or twill abdominal binder may be worn for a day or so, but it is better for the abdominal muscles if gentle exercises be undertaken instead of relying on the older idea of a binder for support. It may take a couple of months before the figure returns to normal.

Douching.—Only in complicated cases should the discharge be excessive or offensive, and occasionally this condition may necessitate a doctor directing the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nurse to give a hot douche—usually containing either iodine or other disinfectant.

In women who have had several children the contractions of the womb following delivery may be painful, and these "after pains" may necessitate the giving of 10-15 grains of aspirin.

During the lying-in period the bowels must be regulated, as constipation clogs the bowel and hinders the involution or shrinkage of the womb. Sometimes an enema may have to be given to promote a freer action. In a few cases the passing of urine may be delayed: this can usually be assisted with the help of heat applied to the lower abdomen, or a persuasive nurse trickling a hot comforting lotion over the vulva. For care of the infant *see* INFANT, CARE OF, and for any trouble with the breasts *see* SUCKLING.

LYMPH.—The fluid in the lymphatic vessels.

LYMPH GLANDS, INFLAMMATION OF.—*See* ADENITIS.

LYMPHADENOMA. — *See* HODGKIN'S DISEASE.

M. & B. 693.—*See* SULPHAPYRIDINE.

MALARIA.—This is a disease of the tropics and is contracted in England only in a few isolated cases, although it is seen amongst patients who have originally acquired the infection abroad.

It is a recurring fever divided into three groups according to the periodicity of the occurrence of the rise of temperature: (1) quotidian, or daily; (2) tertian, or recurring every third day; (3) quartan, or recurring every fourth day.

Until comparatively recent times the origin of malaria was obscure, but in 1880 a French observer, Laveran, was able to demonstrate that a parasite existed in the blood of malarial patients. In 1894 the late Sir Patrick Manson and Sir Ronald Ross, acting on a theory put forward by the former, were able to prove that the parasite existed also in a group of the mosquito family known as the Anopheles, and that the mosquito, in the act of biting man, communicated the disease to the latter and thereby enabled the parasite to complete the second part of its life-cycle. Each can infect the other, e.g. a mosquito bites a malaria patient and ingests the parasite, while conversely the latter bites a healthy man and so inoculates him in turn. The parasite is present in the saliva of the insect. When the parasites gain access to the human blood, they enter the red cells there, grow, and eventually split up into a host of small bodies (the offsprings) which burst out of the blood cells into the blood stream. The occurrence of this last phenomenon coincides with the onset of an attack of malaria, or ague, as it is popularly known. It serves also to explain the division of the disease into the daily, the three-daily and the four-daily, for it has been found that it may take twenty-four, forty-eight or seventy-two hours for a brood to hatch out and be liberated in the blood stream.

Symptoms.—An attack of malaria can be divided into three more or less definite stages. Preceded by a feeling of general lassitude with aching in the head, back and limbs, the first or cold stage is characterized by the onset of shivering. The patient looks and feels cold. He expresses himself as being "chilled to the bone" and his teeth chatter. This stage lasts from one to one and a half hours. It is succeeded by the second, or hot, stage. From being cold he becomes intensely hot with a flushed and dry skin, and the temperature rises rapidly to, as a rule, 104° F. The pulse rate and the rate of breathing increase correspondingly. General aching continues, particularly headache, and there is marked restlessness and frequently delirium, diarrhœa and vomiting are common. This stage lasts, on the average, three to four hours. The third and sweating stage is in the nature of a crisis. Sweating commences and becomes profuse, fever rapidly subsides and the patient gains profound relief from his unpleasant symptoms. Despite this improvement the case, unless actively treated, will have a recurrence after an interval corresponding to the "breeding time" of the parasite—twenty-four, forty-eight or seventy-two hours.

Treatment.—As soon as an attack occurs the patient should be put to bed and kept there until the temperature returns to normal. A purgative, followed by a saline purge, should be given. A diaphoretic to induce perspiration, aspirin to relieve headache, and plenty of alkaline fluids to drink are indicated. For many years quinine, preceded by a dose of calomel and followed by salts, was the chief remedy for this fever, but of late years synthetic drugs, such as plasmoquine, atebrin and mepacrine, have largely superseded it for both treatment and prevention. Other precautionary measures include the exclusion of mosquitoes from dwellings by fine wire gauze fixed to doors and windows, and the use of mosquito nets over beds, as the risk of being bitten is greatest after nightfall.

MALFORMATIONS, CONGENITAL.—These are the result of defective development before birth. They include club-foot, hare-lip, cleft palate, etc.

MALTA FEVER. — *See* UNDULANT FEVER.

MANIA.—A form of insanity with great mental and emotional excitement. There is often a tendency to violent behaviour.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MANY-TAILED BANDAGE. — *See* BANDAGES.

MARASMUS.—*See* WASTING IN CHILDREN.

MASSAGE.—This may be described as an anatomical rubbing or manipulation. It is really a form of movement done for, and not by, the patient, and its effect is the same as active movement by the patient himself. Power of movement is preserved, blood supply to the tissues is maintained, thereby assisting in the absorption of waste products. Further, the effects of massage are both tonic and soothing. It is for these reasons that it is of use in such a variety of conditions as the reduction of collections of fluid, in constipation, for the relief of pain in rheumatism, in the treatment of fractures and sprains, and in the various forms of paralysis.

MASTOID DISEASE.—The ear may be divided into three sections: (1) the outer ear passage, or meatus; (2) the middle ear; and (3) the inner ear. The middle ear communicates with the mastoid process—a collection of air spaces enclosed in bone and lying directly behind the ear. These all communicate with each other. It therefore follows that inflammation in any one may spread to the others. It may even involve the brain and its coverings, causing meningitis.

Inflammation in the mastoid process frequently proceeds to abscess. This is a serious condition requiring surgical treatment. No case of "earache," particularly in a child, should ever be neglected, in case the inflammation spreads.

MEASLES.—Measles is one of the infective fevers of childhood, though occasionally seen among adults. As with most of the "infectious" illnesses of children, it is characterized by a rash. In measles the rash does not appear until the fourth day. Previous to that the child has been "out of sorts," and a little feverish. It appears to have a cold, the eyes are dull, congested and watery, and sneezing is a marked feature—as is also a hard dry cough. The rash appears first on the face and neck, spreading within the following forty-eight hours to the body and limbs. It is typically "blotchy" and of a dusky red hue. By the end of a week it has practically faded—having become meantime a browner and fainter colour. The temperature rises sharply with the rash, and falls by the end of a week.

Measles is essentially an acute infective catarrh of the air-passages—nose, throat, bronchial tubes and lungs. Hence it is that one of the commonest complications is broncho-pneumonia. Other complications are inflammation of the eyes, swelling of glands in the neck, and even abscess formation and inflammation in the middle ear. As with other diseases of childhood it is prone to leave the child in a condition of poor health, and to lower resistance to other infections, amongst which tuberculosis is one to be particularly guarded against.

The exact cause is unknown. The incubation or "brewing" stage is generally fourteen days, but varies from nine to eighteen days. This stage is infectious. The attack does not confer immunity, although second attacks are rare.

Treatment.—Confinement to bed in a warm but well ventilated room is necessary as long as fever continues. The diet should be light—soups, meat jellies, custard, milk and milk puddings. Plenty of fluid should be given, including plain water, mineral waters, barley-water, etc. These favour skin action, as also does tepid sponging. Even a warm bath daily may be given, especially if there be much skin irritation. Regular action of the bowels should be ensured. Medical advice should be sought in all cases if measles be suspected, and medicinal remedies administered only on the orders of a qualified medical attendant in whose hands will also rest the treatment of any complication arising.

MEASLES, GERMAN.—*See* GERMAN MEASLES.

MEDICINES, and How They Are Measured.—The effect of medicines may be regarded as chiefly physical but partly mental, that is to say that a medicine in which for some reason a patient has no faith is much less likely to benefit him. Self-medication is a habit to be firmly discouraged, as it is apt to lead to a condition of introspective exaggeration.

Although certain drugs are universally used in the treatment of known complaints, it must not be forgotten that there are individuals who can in no circumstances tolerate some of these.

Classes of Drugs.—Drugs to soothe the nervous system are known as *sedatives*; sleep-inducing drugs are *hypnotics*; and those which relieve pain and encourage sleep are *narcotics*. Increased action of the bowels may be brought about by *laxatives* and *purgatives*, the action of the former being less drastic. *Diaphoretics* encourage skin action and, therefore, perspiration. The kidneys are stimulated by substances known as *diuretics*, and the lungs by *expectorants*.

Forms of Drugs.—Drugs may be given as liquids, as powders and as pills. Other forms are *tablets* (which are pleasant to take and retain their efficacy under adverse conditions for long periods), *capsules* (small gelatine cases enclosing the drug) and *cachets* (in which the drug is surrounded by wafer paper).

The Time to take Medicines.—As a general rule, medicines are taken soon after

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

meals. There are, however, exceptions. For instance, an acid medicine prescribed in order to supplement a deficiency in the acid gastric juice should be administered not sooner than an hour after food, while an alkaline mixture to aid neutralization of excessive stomach acidity must be taken from ten to fifteen minutes before a meal.

Medicinal Measures.—In liquid form medicine is measured in the following amounts:

60 minims	=	1 fluid drachm
8 fluid drachms	=	1 fluid ounce
20 fluid ounces	=	1 pint
40 fluid ounces	=	1 quart
4 quarts	=	1 gallon

The definition of these terms may be taken as follows:

1 minim	=	1 drop
1 drachm	=	1 teaspoonful
2 drachms	=	1 dessertspoonful
½ ounce	=	1 tablespoonful
1 ounce	=	2 tablespoonfuls
2½ ounces	=	1 wineglassful
½ pint	=	1 tumblerful

Rather than rely on the accuracy of such domestic equivalents, a measuring glass should be used.

Solid drugs are measured by weight, in which case a drachm is 60 grains.

MEDITERRANEAN FEVER. — *See* UNDULANT FEVER.

MEDULLA OBLONGATA.—*See* BRAIN.

MELANCHOLIA.—*See* INSANITY.

MENIÈRE'S DISEASE. — This is a condition caused by any interference with a section of the auditory apparatus known as the semicircular canals, by whose action the body balance is preserved. Such interference may be hæmorrhage, the pressure of growths, or inflammation.

Symptoms are nausea and vomiting, intense giddiness, noises in the ears and partial deafness. The attacks are paroxysmal, coming on suddenly and varying in their interval between recurrence from perhaps several times a day to once in a few weeks. The patient hears noises in the ears, reels about or even falls.

Treatment.—The patient should lie down and be kept quiet, preferably in a darkened room. Medicinal measures include bromides, iodides, salicylates, quinine. Blistering behind the ears has been found to be helpful.

MENINGES.—*See* MENINGITIS.

MENINGITIS is an inflammation of the meninges or membranes by which the brain is covered. There are three forms: (1) cerebro-spinal, popularly termed "spotted fever" (*see* CEREBRO-SPINAL FEVER); (2) suppurative; (3) tuberculous.

Suppurative Meningitis is caused by direct spread of some neighbouring infection, i.e. middle ear inflammation or a septic wound of the scalp; or infection may be conveyed by the bloodstream from a septic focus elsewhere.

Symptoms. — Sudden onset of violent headache, shivering, followed by high temperature, vomiting, delirium, convulsions, spasms of the neck muscles causing the head to be drawn back in a characteristic attitude. This is the irritable stage, and is followed by the stage of stupor or coma, where paralysis replaces convulsions.

Treatment.—Bed in a dark room, quiet, the application of ice to the head, effective purging, the removal of any obvious septic focus and, if the organism can be discovered, the administration of an appropriate serum. Convulsions and other symptoms of irritability are relieved by bromides or chloral.

Tuberculous Meningitis is invariably in association with tuberculosis elsewhere. It occurs most frequently in children, and is nearly always fatal.

Symptoms.—These are similar to those of the suppurative form, but tend to run a longer course. The temperature is more irregular and there is more spasm of the muscles, hence more marked drawing back of the head; the belly tends to be drawn in and the limbs drawn up. A feature is the occurrence of a peculiar shrill cry (due to headache) known as the hydrocephalic cry.

Treatment. — The administration of streptomycin is giving some grounds for hope that in the future this may be a cure.

MENOPAUSE. — *See* MENSTRUATION AND THE MENOPAUSE.

MENORRHAGIA.—This may be defined as excessive menstruation or excess of the normal menstrual period, as regards both amount and duration. It will thus be understood that the term is a relative one according to the type to which a particular patient conforms, e.g. if a woman, who normally menstruates for three days and "loses" three ounces, commences to menstruate for a week and "loses" six ounces she is said to be suffering from menorrhagia. The source of bleeding is the mucous membrane of the womb. It is confined to the period only. Any loss occurring between one period and another is known as *Metrorrhagia*.

Causes may be local or general.

(1) Local.—Any condition likely to disturb the generative organs, such as inflammation, displacement, growths like fibroid or cancerous tumours or polypi.

(2) General.—Disorders of the liver and kidney, blood diseases associated with bleeding, such as hæmophilia, disturbances of the nervous system—e.g. worry and the effects of over-fatigue.

Treatment.—Details of treatment must

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

necessarily rest with the doctor in attendance. They may include hot vaginal douches. In some cases surgical treatment is necessary. As immediate measures to cause cessation of hæmorrhage, the patient should be put to bed—the foot of the bed being raised—and kept absolutely quiet, no movement being permitted, and ice applied to the lower part of the abdomen. Medicinal remedies employed aim at causing contraction of the womb. On no account should alcohol be given: by increasing contractions of the heart it will automatically tend to increase hæmorrhage. Because of its opposite effect morphia is sometimes used.

MENSTRUATION AND THE MENOPAUSE.—Menstruation is the monthly period or "courses." It consists of a periodic blood discharge from the womb. Every woman has her type as regards both periodicity and duration, e.g. bleeding may occur at three- to five-weekly intervals and last from two to ten days. Provided it be consistent as to regularity and duration it is regarded as normal. On the average menstruation occurs every twenty-eight days and lasts five days. Menstruation begins at from twelve to fourteen years. It is found to begin earlier in the darker races and in the warmer climates. The average duration of continuance is thirty years and its cessation is known as the *Menopause* or *Climacteric*.

The essential feature in menstruation is the setting free from the ovary of the tiny (microscopic) ovum or egg, which is periodically produced by it. The ovum passes from the surface of the ovary down the Fallopian tube to the womb and is then expelled from it along with the mucous lining of the womb, expulsion of the latter causing the flow of blood associated with menstruation. Menstruation has therefore been well described as a miniature pregnancy. If, however, the ovum is impregnated by a spermatozoon which happens to be present in the womb or the Fallopian tube its progress is arrested in the womb, the flow of blood does not take place, and pregnancy begins.

Apart from the bleeding, menstruation is, in some, associated with a general disturbance, mental and physical. No woman is at her best during a "period." This, however, is far less often true nowadays than formerly was the case. Today, the tendency is for the majority of women to accept it as a normal function. Some do suffer from pain in the abdomen and back, and may be irritable or languid—but in decreasing numbers.

The onset of the menopause marks the end of the child-bearing life of a woman, and may be associated with a train of unpleasant symptoms. Menstruation becomes irregular and for a varying period there may be associated general disturbances, tachycordia, flushings, indigestion, lassitude and insomnia. Even with the cessation of the "periods" the return to normal may be slow. During the period of transition great care must be taken: a regular life should be the rule, and any digestive disturbance corrected, e.g. constipation. Glandular treatment is of the greatest benefit.

MERCURY POISONING, ACUTE.—Mercury in various forms is used chiefly as a disinfectant, and also for commercial purposes. It is a corrosive poison destroying tissue. Washing out the stomach is therefore dangerous owing to the risk of "perforation." Treatment of acute cases consists in administering soothing substances such as white of egg beaten up in milk, barley-water, arrowroot, flour and water. Morphia for the relief of pain is also given. Chronic cases are found chiefly in those whose work brings them in contact with different mercurial preparations, and the poison may be inhaled in the course of breathing or ingested from the hands, whilst the symptoms consist of debility, profuse flow of saliva associated with soreness of the mouth and gums and abdominal pains of a colicky nature. This condition is also seen in patients treated by mercury for prolonged periods. Treatment consists in breaking the contact with mercury, whether medicinal or commercial, appropriate mouth washes, tonics and giving iodides.

METRITIS. — *See* WOMB, INFLAMMATION OF.

MICTURITION, FREQUENT. — Normally 50 oz. of urine are passed daily. It is a well-known fact that a male passes urine more frequently than a female. Frequency may be due to the production of too great an amount of urine—this occurs typically in diabetes. On the other hand, any irritation of the bladder stimulates contraction or emptying. Among such causes are too acid or too salt urine, inflammation of the bladder, stone, ulceration, enlargement (in the male) of the prostate gland, irritation from without—such as worms, enlargement of the womb as in pregnancy, displacement of or tumours in the womb. The bladder, too, may participate in any undue excitation of the nervous system, the result of actual nervous disorders, or merely emotional disorders.

Treatment must be directed to the cause and is therefore often surgical. A urine that is too acid requires the administration of alkalis such as sodium bicarbonate. Conversely a highly alkaline urine is counteracted by giving acids—e.g. dilute hydrochloric acid. Scanty urination

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

demands the partaking of an extra amount of fluid.

MIDDLE EAR DISEASE.—*See* EAR, DISEASES OF.

MILIARIA PAPULOSA.—*See* PRICKLY HEAT.

MILK FEVER.—*See* PUERPERAL FEVER.

MILK TEETH.—The child's first set of teeth. They are described under TEETHING.

MINER'S ANÆMIA.—This is a tropical disease found among miners, navvies and those whose work is with the damp earth. It is caused by a hook-worm called the *Ankylostome*, and, in America, by the *Lucinaria*. The larvæ gain access to the body through the skin and eventually reach the small intestine, to the mucous membrane lining of which they cling, sucking blood and causing irritation. The symptoms are anæmia, abdominal pain and diarrhœa. They are partly due, also, to bacterial infection of the "sore spot" and to a poison produced by the worm.

Treatment, after first thoroughly emptying the bowel, is to give menthol, beta-naphthol, oil of chenopodium.

MINER'S NYSTAGMUS is caused by the adverse conditions of light in which work is performed. The chief symptom is *nystagmus*—an oscillation of the eyeball. Other symptoms are dimness of vision, congestion of the eyeballs and lids, headache, nausea and dizziness. Light is tolerated badly and resented. Treatment consists in removal from the causal surroundings and the treatment by glasses of any existing error in refraction.

MISCARRIAGE is the expulsion of the contents of the pregnant uterus before the fœtus is capable of a continued separate existence, e.g. before twenty-eight weeks. If occurring after that time, the child can live on its own, and the condition is then termed *premature labour*.

Causes.—Miscarriage may be due to injury, a fall, or to nervous reactions. A lack of vitamin E predisposes to it, and any local source of irritation—chief among which are growths or displacements of the womb itself, similar conditions of the neighbouring pelvic organs, severe diarrhœa or constipation, and severe purging. Syphilis is also a common cause of miscarriage. Another cause recently recognized is an incompatibility between certain factors in the blood of the father and the mother, known as rhesus factors. It is therefore advisable that the father's and mother's blood should be examined before confinement.

Symptoms.—The chief one is hæmorrhage, and this may be slight or severe. It is accompanied by pains more or less of the nature of "miniature labour" pains, i.e. pain in the back, loins and thighs. A characteristic feature of such pains is that they are, as a general rule, intermittent, coming and going. No married woman who has missed one period and then become "unwell" again should neglect to seek medical advice. In the more advanced cases there may be hæmorrhage varying in degree and accompanied by a dribbling of watery fluid. This indicates that the bag of membranes containing fluid, and in which the fœtus floats, has ruptured.

Treatment must remain in the hands of the doctor. According to conditions he will treat the case as one of threatened or inevitable abortion. In the first case, by ensuring complete rest in bed—preferably with the foot of the bed raised on blocks—and administering opium or its derivatives by the mouth or by injection into the bowel, he will aim at prevention. In the second case, his object will be to assist what cannot be prevented—contraction of the womb and, therefore, expulsion of the fœtus will be encouraged by the giving of ergot by the mouth or by hypodermic injection. Such measures tend also to lessen the hæmorrhage.

In many cases they will have to be reinforced by plugging the vagina, which further encourages expulsion and checks hæmorrhage. Frequently, however, it will be found necessary to give an anæsthetic and empty the womb of the fœtus and afterbirth by hand.

MOLES.—Moles are pigmented, generally hairy, growths on the skin surface varying in shade from light brown to black. They may be single or multiple and be present from birth or develop later, and they occur on any part of the body but most frequently on the face and trunk.

Treatment is only necessary owing to increasing size or, on the face, for æsthetic reasons. It consists in complete removal by the knife or destruction by carbonic-acid snow.

MORBILLI.—Another name for measles.

MORNING SICKNESS.—*See* PREGNANCY.

MORPHIA.—*See* DRUG HABIT; NARCOTICS AND HYPNOTICS.

MORTIFICATION.—*See* GANGRENE.

MOSQUITO BITES.—*See* BITES.

MOUTH, INFLAMMATION OF (STOMATITIS).—This is an inflammatory condition of the mucous membrane of the mouth and tongue. It occurs during the progress of teething, in the course of the infective fevers and in any condition producing general ill-health, such as consumption or rickets. The degree of severity varies from mere soreness to actual ulceration. The symptoms are excessive secretion of saliva, painful mastication, unpleasant breath and general debility. Ulceration is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

seen most frequently in weakly children, the ulcers showing as small greyish patches and being associated with the enlargement and tenderness of the glands under the jaws.

Treatment.—General treatment takes the form of tonics, such as iron reinforced by cod-liver oil. The spots should be painted with glycerine and borax and a mouthwash of boric acid solution used. Diet consists of slops.

MOVABLE KIDNEY.—In this condition the kidney slips down from its bed. It is caused by muscular strain or weakness and by diseases of the kidney. The right side is more commonly involved and women more prone to the condition than men.

MUMPS.—This is an acute infectious fever associated with tenderness and swelling of the parotid glands in the region of the ears. The causal germ is not known. Infection lasts for three weeks and the incubation period may be twenty-eight days. Mumps is a disease of childhood, but no age is exempt. The onset is associated with rise of temperature followed by pain, tenderness and swelling below one ear. Within a few days the opposite side may be affected. The commonest complications are inflammation of the breasts or testicles.

Treatment.—The patient should be put to bed and remain there for ten days. A purgative, hot fomentations and an antiseptic mouthwash are all that is necessary. Any debility resulting may then be treated by tonics.

MUSCÆ VOLITANTES.—*See* EYES, SPOTS BEFORE.

MUSCLES AND TENDONS.—These constitute the flesh of the body. *The muscles* are divided into two groups:—

1. Voluntary muscles enable us to make necessary movements and are under our conscious control. They are attached to bones and cartilages and by their contractions operate on the joints.

2. Involuntary muscles are not under the direction of the will and we are unconscious of their action. They may be described as the muscles of the blood-vessels and internal organs, enabling these to move.

Tendons.—Often called "leaders," these are whitish, glistening cords. They lie in tubular sheaths lined with a lubricating fluid, the synovia, and attach the muscles to the joints.

MUSCULAR RHEUMATISM. — *See* RHEUMATISM (MUSCULAR).

MYALGIA.—*See* RHEUMATISM (MUSCULAR).

MYELOMAS.—*See* TUMOURS.

MYOCARDITIS.—Inflammation of the muscular tissue of the heart. *See* HEART DISEASE.

MYOMAS.—*See* TUMOURS.

MYOPIA.—*See* SIGHT, DEFECTS OF.

MYXŒDEMA.—This condition is the result of degeneration of a gland lying in front of the windpipe and known as the thyroid.

Symptoms.—A noticeable feature is the sluggishness of the mind and body. The patient is cold, lethargic and of a pale, waxy appearance and curiously lacking in expression. The face and hands are swollen and the abdomen distended. The skin is thickened and dry and the hair scanty and coarse. Swelling of the lips and tongue give rise to a slow, indistinct speech.

Treatment.—Cold should be avoided and warm bathing is of benefit. Extract of thyroid gland is administered in order to replace the deficiency in the patient's own thyroid and can be continued indefinitely, the dose being regulated by the results obtained.

NÆVI.—*See* BIRTHMARKS.

NAILS, CARE OF. — For hygienic reasons this is a matter of great importance, quite apart from the question of appearance. Infection and disease may result from eating without careful cleaning of the hands and nails beforehand. The nails should be kept reasonably closely cut and cleaned with a suitable nail-brush. Dirt should never be removed by scooping it out with the point of a pen-knife or similar instrument. Such a method merely increases the space between the nail and the pulp of the finger in which dirt can accumulate. In contradistinction to finger-nails, toe-nails should be cut straight across or even concave. This obviates the tendency to ingrowing toe-nail.

NAILS, DISEASES OF.—A nail is essentially an out-growth from the skin of the nature of cornification or horn-formation. Growth is from a nail-bed or root. Irregularities in the shape of the nail are associated with diseases of nutrition. In consumption and heart-disease, nails tend to be unduly curved. In gout they are ridged along their length and in certain skin diseases, e.g. psoriasis, from side to side. Of purely local nail affections, inflammation or onychia may be noted. In most instances it results in the formation of matter or pus beneath the nail, which may eventually be pushed off from the pulp of the finger and lost. Such a condition may be prevented and sometimes cured by the application of hot fomentations, but frequently surgical intervention is necessary to release imprisoned matter. The cause is generally some injury such as a splinter, and wounds so caused become infected.

In ingrowing toe-nail, the nail grows into the flesh, causing much pain, inflammation, matter formation and even ulceration. The condition may occur in any toe,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but is seen in all but a few instances on the outer side of the big toe. It is caused by shoes that are too narrow or by cutting the toe-nail in a too convex manner ⌒ instead of square or in a concave ⌣.

Treatment consists in remedying the cause by wearing suitably broad footwear, by correct cutting of the nail, even exaggerating this by removing a small V-shaped wedge from the centre, thus: M ; and, further, by applying hot boric-acid fomentations for the relief of pain and inflammation. Any overhanging flesh may be prised away with a sterilized probe and a thin strip of gauze, lint or wool inserted as a wedge. Severe or obstinate cases require operation under general or local anæsthetic when the whole or only the third of the nail with its bed is removed.

NARCOTICS and HYPNOTICS.—Of these there are numerous drugs and only the more common will be mentioned.

Opium has been known and used through the ages. It is the great reliever of pain—dulling the nerve centres which record pain. Again, acting through the nervous system, it lessens the activity of the organs of the body, and is thus of use in conditions such as over-acidity of the stomach, diarrhœa, bronchial catarrh, its action being to lessen secretions. When taken for non-medicinal reasons by an addict, the eventual consequences are disastrous, culminating in serious impairment of health and undermining of the whole mental and moral fibre. Previous to such a condition being reached the habitué will have found that the drug gives him a feeling of well-being; his self-consciousness is lessened, his mental agility and powers of conversation correspondingly increased. These are the first effects of opium, but they are succeeded by a feeling of drowsiness passing into stupor and, if a sufficiently large dose has been taken, death may supervene from paralysis of the nerve centres controlling respiration. Anyone who has contracted the opium or morphia (a derivative) habit finds himself becoming gradually dependent on the drug. He is normal only when under the influence and in the intervals is depressed, morbid and ill. By degrees the stage of exhilaration can be maintained only by increasingly larger and more frequent doses.

Chloral, whilst productive of sleep, has little effect on pain. The after-effects are less unpleasant than those of opium, but the same tendency to acquire a "habit" must be carefully guarded against, and a fatal issue from an overdose may occur.

Veronal, Sulphonal, Trional, are typical hypnotics without influence over pain. They should, like all drugs of this class, be taken only under qualified medical direction.

Cocaine is used chiefly as a local anæsthetic for minor operations and for the relief of various forms of irritation, such as piles. It is known to the "underworld" and to addicts as "snow." As with opium, there is an initial effect of mental and physical well-being, but followed by symptoms of collapse. Taken over any length of time the drug produces impairment of mental efficiency, insomnia and general ill-health.

Tobacco in moderation is practically harmless and exerts a definitely soothing effect on the nerves which is beneficial. The amount necessary to constitute excess varies with the individual, but smoking on an empty stomach and inhaling are to be avoided. The active principle of tobacco is nicotine and the main consequence of over-smoking—palpitation and irregularity of the heart—is due to an injurious action on the nervous system. Irritation of the throat and bronchial tubes is common, producing the well-known "smoker's cough" and associated with much expectoration.

NASAL CATARRH. — *See* CATARRH, NASAL.

NASAL POLYPUS. — *See* POLYPUS, NASAL.

NEPHRITIS.—*See* BRIGHT'S DISEASE.

NERVOUS DEBILITY.—*See* NEURASTHENIA.

NERVOUS SYSTEM.—This consists of the brain, the spinal cord, the nerves and nerve-centres or ganglia.

The brain proper or cerebrum consists of two large hemispheres partly separated by a cleft or fissure running from before backwards but bound together below by bands of fibres. Each hemisphere consists of two layers. Of these the outer or cortex consists of "grey matter," the inner of "white matter." The cortex is divided by furrows into a series of folds known as convolutions. The white matter is composed of conducting nerve-fibres. It is the function of the cerebrum to exercise conscious control of the powers of the mind and body.

The cerebellum or small brain lies below the cerebrum and is similar in structure. It regulates or times the movements of the body.

Below the cerebellum we find the medulla oblongata, which links the former and the cerebrum with the spinal cord.

From the brain proceed twelve pairs of what are termed cranial nerves. They pass out through openings in the skull and supply the organs of sight, hearing, smell and taste. One, the vagus, passes down to the throat, lungs, heart and stomach.

The brain is covered by three layers of membranes, between the inner two of which is the cerebro-spinal fluid which acts as a shock absorber to any severe impact

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on the skull.

The spinal cord is a column of grey matter and white matter which runs practically the whole length of the back and is enclosed in the chain of bones termed the spinal column. It serves to conduct nerve impulses to and from the brain. From it are given off thirty-one pairs of spinal nerves.

These are of two varieties—i.e. the sensory and the motor. The former transmit to the brain sensations of pain, heat and cold. Motor nerves convey messages from the brain producing movements of the muscles.

There is a still further series of nerves constituting the "sympathetic" nervous system which, by supplying the internal organs, generally regulate their action.

NETTLE RASH.—*See* URTICARIA.

NEURALGIA.—This term implies pain in the area supplied by a nerve without structural alteration in the latter. Women are more commonly affected than men. The causes are debilitating diseases, exposure to cold, local irritation, e.g. from a decayed tooth, over-indulgence in alcohol, tobacco, and even tea or coffee. The pain tends to be paroxysmal and varies greatly in degree. Muscular twitching may occur and over-secretion, e.g. watering of the eye.

A special variety known as facial neuralgia or "tic douloureux" is of an extremely severe nature. It may affect any part of the face, but rarely occurs on both sides. The pain is agonizing and may be started by the slightest exciting cause such as eating, a slight touch, a waft of cold air or mental shock. There is extreme tenderness and the eye and the nose may "run." In chronic cases the hair may turn grey or fall out.

Treatment.—Any source of local irritation must be removed, e.g. defective teeth, errors of refraction. If in association with diseases such as rheumatism, gout, diabetes, anæmia, these must be treated. Tonics and massage will improve the general health and the patient should live in an even temperature, but with sufficient ventilation. A generous diet, particularly in regard to fats and vitamin B, is needed. Quinine and gelsemium are the two most successful drugs and, for the relief of pain, salicylates, iodides or substances of the antipyrin group are useful. Among local applications a menthol paint may help or the liniments of aconite, belladonna or chloroform, as also hot fomentations or blisters.

NEURASTHENIA.—This is a condition of exhaustion of the nervous system brought about by prolonged overwork, worry and grief. It is also seen after severe shock or injury and is then known as traumatic neurasthenia.

Symptoms.—There may be loss of weight with poor digestion and irregular action of the bowels. Vague pains in any part of the body are complained of and insomnia is common. The patient may be querulous or given to brooding. He lacks self-confidence and cannot concentrate and worries over trifling matters.

Treatment.—Complete change, rest and tonics are necessary and a cure may take several weeks. It will be expedited by removal to a nursing home, where worries and too sympathetic friends can be excluded. Suitable electrical treatment is a benefit.

NEURITIS.—This may be local, limited to one or a group of nerves, or multiple, involving several nerves.

Localized Neuritis is caused by injury or exposure to cold and occurs also in the course of such diseases as rheumatism, gout, diabetes, lead and arsenic poisoning. First, there are experienced sensations of burning, tingling, numbness, and these are later accompanied by pain. If a motor nerve be affected, loss of power and wasting of the muscles supplied is seen.

Multiple Neuritis is due to metallic poisons, to the infective fevers and to rheumatism, gout, diabetes. It is also seen in cases of alcoholism. The symptoms range from tingling, numbness and pains in the feet and hands to complete loss of sensation and power. The commonest form is the alcoholic, where feet and hands may become "dropped," hanging down helplessly from the ankles and wrists. In the lead neuritis, common among painters, the wrists alone are affected.

Treatment for Neuritis.—This is on the same general lines as for neuralgia and will include attention to the causal agent—disease or poison. Massage and electrical treatment should not be employed until pain and tenderness have more or less ceased.

NEUROMAS.—*See* TUMOURS.

NIGHT TERRORS.—These occur in highly strung, nervous children who are permitted too much excitement and indigestible articles of diet, especially if partaken of the last thing at night. Whilst not serious, the attacks are alarming, the child waking up after an hour or two in bed screaming and in a state of terror. It is soothed, however, by a few comforting and reassuring words. A routine of regular meals, exercise in the open air, stopping short of fatigue, and avoidance of excitement should be strictly adhered to.

NIPPLES, CRACKED.—*See* SUCKLING.

NITRIC ACID POISONING.—Nitric acid or aqua-fortis is a corrosive or burning poison. When taken it stains the mouth and lips a bright yellow. Alkalis should be given, such as a tablespoonful of lime

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

water or magnesia in a tumblerful of milk or gruel. Other remedies are chalk, carbonate of soda, stirred up in water and sipped slowly. For their soothing effect, beaten-up eggs and arrowroot are useful. On no account must an emetic be employed.

NITROUS OXIDE GAS.—*See* ANÆSTHESIA.

NOCTURNAL EMISSIONS. — *See* SPERMATORRHŒA.

NOISES IN THE EAR.—*See* EAR, DISEASES OF.

NOSE-BLEEDING.—This may result from some constitutional condition or from blood-pressure and be serious. It may also be caused by a severe blow. In other cases it is of little consequence if not too protracted.

Treatment.—The patient should sit up pinching his nostril firmly while those around him mop his face, head and neck with cold water. Raising the arms above the head is also to be recommended. Failing cessation of bleeding, plugs of cottonwool should be pushed up the nostrils, which are again firmly held. If it is found necessary to call in a doctor he may resort to plugging the nostrils with gauze. Sometimes plugs of lint have to be inserted from behind as well as in front or a particular bleeding-point cauterized.

NOSTRIL, FOREIGN BODIES IN.—*See* FOREIGN BODIES.

NOTIFICATION OF DISEASES.—The diseases a medical practitioner is compelled by law to notify are the following: smallpox, scarlet fever, typhus fever, typhoid fever, relapsing fever, continued fever, puerperal fever, puerperal pyrexia, diphtheria, erysipelas, tuberculosis, pneumonia (primary or influenzal), membraneous croup, cerebro-spinal fever ("spotted fever"), encephalitis lethargica ("sleepy sickness"), infantile paralysis, ophthalmia neonatorum, cholera, plague, malaria, dysentery, trench fever, anthrax. Certain other diseases may be made notifiable at the option of the local sanitary authority. These include yellow fever, measles, German measles, whooping-cough, chickenpox and mumps.

NUMBNESS.—Apart from being a symptom of disease, numbness may be produced in a limb by pressure on a nerve, temporarily interfering with its function. Such a condition may be observed in the hand from pressure of the elbow on a table, in the leg from pressure on the edge of a chair or sitting with the knees crossed for too long.

NURSING, DOMESTIC.—The following principles and practice should be grasped by anyone who may be called upon to nurse a patient.

Temperature of the Sick-room.—The average temperature of the sick-room should be maintained at from 60° to 65° F. throughout the whole twenty-four hours. It is, however, most unwise to exclude air; ventilation is essential.

Water-bed.—It is advisable when about to use a water-bed to reinforce the mattress by inserting planks beneath it. The empty water-bed is then placed on top. It is essential to fill it completely, using tepid water. Over it is stretched tightly a thick blanket followed by a mackintosh sheet, a linen sheet and a draw-sheet. The bed is now ready for the patient. If water-pillows or water-cushions are found necessary to relieve pressure on particular parts and prevent bed-sores, they are best filled with a mixture of air and water but only to half their full capacity. The draw-sheet is to obviate the consequences of soiling. It consists of a sheet folded into four and is placed crosswise over the bed under the patient's buttocks. Any portion that becomes soiled can be drawn aside.

Bedclothes.—These should be well aired and neither too heavy nor too light. A good supply of pillows is essential to the comfort of a patient who is sitting up. They should be arranged carefully behind the shoulders and back and it is an advantage to place one under the knees. It should be rolled in a sheet and the ends tied to the top of the bed. By this means slipping down is prevented. Sheets should be changed regularly and in doing so the following method employed. For the top sheet, uncover the patient of bedclothes with the exception of the sheet and one blanket; pull out the sheet, leaving the blanket; over the blanket place the clean sheet and draw out the blanket. For the success of the manœuvre assistance will be required. In changing the lower sheet assistance is again necessary. First the clean sheet is rolled up lengthways to half its width; the patient is rolled well over on his side and held by an assistant; the upper bedclothes are folded back over him and the dirty lower sheet rolled up against his back followed by the rolled portion of the clean sheet. The remainder of the latter is smoothed out over the unoccupied portion of the bed following which the patient is turned on to his other side, passing over the two rolls of sheets. While he is held in this position the dirty sheet is removed and the remaining roll of clean sheet unwound.

The Bed-Pan.—Ordinarily these are of two types, the round and the slipper. Care is necessary when placing a bed-pan in position not to abrade the skin of the buttocks. The patient should be gently raised by placing a hand under his back. In helpless cases assistance is advisable. After use the pan is covered and removed from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the room, cleansed, and some form of antiseptic placed in it.

Cleansing the Teeth.—In extremely weak patients unable to clean their own teeth, a piece of linen should be wrapped round the finger, moistened in mouthwash and used for the purpose.

Bed Baths.—All necessaries should first be got ready and the window closed. The patient is then stripped of all except the top sheet and rolled up in a blanket, the sides of which are folded in front of him. One part at a time is washed, dried and immediately covered. Finally, the clean night attire, which has been warming in front of a fire, is put on, the top sheet replaced and the blanket removed.

Lifting.—One arm should be placed under the hips, the other under the back just below the shoulders, and the patient raised. It is better and often necessary to obtain assistance and, standing on opposite sides of the bed, to lift by means of a draw-sheet.

Sick-room Appliances. — Cradles are useful for supporting bedclothes which may be causing discomfort by their weight. They can be hired or purchased, but may be improvised by a small stool or a box from which the top, bottom and one side have been removed. The advantages of a bed-rest, in which any desired angle may be obtained, are obvious. Leg-rests are used in any injury or painful affection of the foot or ankle. A bed-table may be made to stand either on the bed or on the floor. Hot-water bottles are generally of metal or rubber, the latter being preferable. They should always be covered, otherwise there is great risk of causing a burn, particularly in cases of unconsciousness or paralysis. Feeding cups with a spout are difficult to clean, and some other pattern is to be preferred.

Taking the Temperature.—*See* TEMPERATURE.

The Nursing of Infectious Cases.—A liberal supply of carbolic solution should be kept in the room and used for soaking clothes, etc., that may have to go "outside" to be washed. All discharges from the patient should similarly be allowed to stand in solution before removal. A sheet should be hung up outside the door and kept damp with the disinfectant, and the nurse should be careful to disinfect her own hands after handling the patient. This is necessary for her own safety. She should endeavour by adequate rest, good meals and at least some time each day spent in the open to ensure her own health and lessen the risk of contracting the disease she is nursing.

OBESITY.—Fatness, due to a disordered fat metabolism, which, though not amounting to a disease, may yet cause much discomfort and eventually lead to invalidism. The tendency to become unduly fat may be hereditary and present from birth, or may arise later in life, usually between the ages of thirty-five and forty-five, or after pregnancy, lactation, the menopause, or operations for castration or the removal of both ovaries. Certain types of glandular insufficiency and anæmia are also characterized by marked obesity.

Treatment. — The simplest forms of obesity due to overeating and unwise food, lack of suitable exercise and fresh air, and over indulgence in alcoholic drink are readily cured if the patient will co-operate in the treatment with a sufficiently strong will. A diet should be drawn up which should be rigidly adhered to until the weight returns to normal, after which the fat-forming foods must be used in moderation only and with an eye on the weighing machine.

As a general rule, the dropping of potatoes, bread, cakes, boiled and milk puddings, fried foods, sugar in tea and coffee, sweets and chocolates and beer and sweet wines for a period of some months will reduce the fat sufficiently and permit of work being carried on as usual. The drastic starvation diets should only be attempted with the patient in bed and under a doctor's supervision, though once the weight has returned to normal an occasional day on orange juice alone may be permitted as an aid to keeping it there. Lean meat and poultry (not game), white fish, green vegetables, stale bread, split toast, rusks, biscuits and fruit (except bananas), with the addition of butter and eggs in moderation, should be the permanent diet of the fat person, and this provides sufficient variety to make meals pleasant. A couple of hours each day should be spent in the open air and from four to eight miles a day should be walked, or its equivalent taken in some sort of exercise. Walking at a rate of less than three miles an hour is not exercise, but on a wet day good exercise may be obtained by walking briskly up and down stairs or performing suitable gymnastic exercises. The bowels should be encouraged to act once or twice daily and the skin should be kept active by baths. Turkish baths and massage help those whose hearts are strong. Water may be drunk freely between meals, but fluids should be restricted with food. If the above measures are faithfully carried out and there is no improvement, then the case is one for the doctor, who will prescribe measures for toning up the faulty metabolism of the body. Glandular extracts and mixtures containing acid should not be taken without medical advice but, when duly prescribed in suitable cases, often act like a charm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

OBSESSIONS.—Strongly held ideas, including phobias or dreads and complexes, which may or may not find expression in action. A person, for example, may be continually unable to prevent himself thinking of some horrible thing although he knows perfectly well that it exists in his imagination alone, or he may continually do something quite irrational, such as walking only on the edge of the pavement, or he may feel it impossible to stay in a room with the door shut, or may be unable to look down from a height without feeling impelled to throw himself over. Obsessions are distinguished from the delusions and illusions of insanity by the fact that the patient knows they have no basis in fact while the insane person does not. Marked obsessions are symptomatic of a psychasthenic state, but most people have mild ones, such as the popular one about not going under ladders. (*See* PSYCHASTHENIA.)

OCCUPATIONAL CRAMPS. — Professional cramp is due to a spasm of a group of muscles which are excessively used in the daily work. Some occupations which are liable to lead to cramp are writing, typewriting, type-setting, sewing, hairdressing, telegraphy, music playing, milking, etc. The condition is a very difficult one to cure, though if the occupation can be changed so that the affected muscles are no longer used they will give no more trouble. Rest, a holiday and tonics may help. Massage and electrical treatment are useful if continued over a period of some months. In writer's cramp the pen may be held between the first and second fingers, or a very thick penholder may be used.

ŒDEMA, or EDEMA.—Swelling.

ŒSOPHAGUS.—The gullet. The canal, about nine inches long, which joins the throat to the stomach.

ŒSOPHAGUS, STRICTURE OF.—The gullet, or œsophagus, may become inflamed and later constricted as the result of injury through swallowing caustic poisons, boiling water or a foreign body. In other cases, the stricture may be due to a spasm of the lower opening of the gullet. The growth of a malignant tumour may be the cause of the stricture. These growths appear usually in persons past middle age; the patient often has to be fed by means of an artificial opening in the stomach, and the mortality is still very high, in spite of modern operative and radium treatment.

OINTMENT.—The ointment is the easiest form in which to apply antiseptics and healing substances to the skin. Lard, wax, lanolin (a fat obtained from sheep's wool) and paraffin are the usual substances used as a base.

ONYCHIA.—Inflammation of the nail bed or matrix. Due to infection by germs, usually from a splinter up the nail. Soak in hot water and use hot boracic fomentations. The nail is usually loosened and may come off permanently or grow on again in a smaller form.

OPHTHALMIA.—Inflammation of the eye. In the simpler forms bathing several times daily with a weak lotion of bicarbonate of soda or boracic will clear up the condition. A much more virulent form is purulent ophthalmia, which is also very infectious and breaks out in epidemic forms in schools, barracks, etc. There is severe pain and swelling of the eyelids and pus pours from the eyes. The temperature is raised and the patient feels ill. The eyes should be cleansed hourly with boracic lotion and a few drops of argyrol (25 per cent) dropped into the eye with a dropper. An ointment such as Vaseline or golden ointment (yellow dilute oxide of mercury) should be smeared on the edges of the eyelids to keep them apart.

OPHTHALMIA NEONATORUM. — This is usually due to infection with gonorrhœa from the mother. As soon as a baby is born its eyes should be attended to by the nurse, who should insert two drops of argyrol into each eye. The eyes must then be carefully watched for signs of ophthalmia and should be bathed daily.

OPIUM.—A narcotic drug obtained from poppies grown in India and China. It produces deep sleep, which may, however, be preceded by great mental excitement and followed by headache and vomiting. A poisonous dose will cause uncontrollable drowsiness, passing into deep sleep and then death. Chronic opium-taking causes moral degeneration.

OPTIC NERVE.—The second cranial nerve, which goes to the eye and is the nerve of sight. (*See* EYE.)

ORAL SEPSIS.—Septic mouth, due usually to the presence of dead and decayed teeth in the mouth and the disease of the tooth sockets known as pyorrhœa alveolaris. A septic mouth can cause so much constitutional disturbance in different parts of the body that it is well worth while to take measures to avoid it by regular cleaning of the teeth, and filling and extracting of teeth whenever necessary. There are many excellent mouthwashes which can be used when the mouth is painful, but the dentist should be consulted.

ORCHITIS. — Inflammation of the testes. (*See* MUMPS.)

ORGANIC DISEASE.—Disease of an organ of the body in which there is a structural alteration.

ORGANOTHERAPY. — Treatment of disease by the administration of animal organs or extracts of them, such as thyroid gland, insulin, adrenalin, pituitrin, extract

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of thymus gland and extract of bone marrow. Thyroid gland is used as a general nutritive stimulant, and is used with great success in myxœdema. Insulin is equally successful in the treatment of diabetes. There are many other animal substances in use, but the extracts of the above-mentioned glands, which belong to the group known as the ductless glands, are the most successful. (*See* GLANDS.)

ORIENTAL SORE.—Also called Delhi boil and Aleppo button, an ulceration met with in the tropics. It is due to a germ which is now known to be carried by flies, and is treated by injections of tartar emetic into a vein and the dressing of the sore with a mild antiseptic ointment such as boric acid or iodoform. Vaccines are now being used with considerable success.

OSTEOMA.—A bony tumour.

OSTEOMYELITIS. — *See* BONE, DISEASES OF.

OTITIS MEDIA.—Inflammation of the middle ear. (*See* EAR, DISEASES OF.)

OTORRHŒA. — Discharge from the ear. (*See* EAR, DISEASES OF.)

OVARIES.—There are two ovaries in the female, one on each side within the pelvis, each about an inch in length and oval in shape. Each ovary is joined to the womb (uterus) by a broad band which contains within its folds a tube (Fallopian tube), to convey the tiny ovum (the microscopic egg, or female sexual element) from the ovary to the womb. The period of menstruation takes place when an ovum is set free (at regular intervals of about four weeks) from the ovary and travels down to the womb; if it is not impregnated it escapes from the womb with the mucous membrane lining and blood which comes away. Each menstruation is therefore a miniature pregnancy which has not eventuated, through the ovum not having been impregnated.

OXALIC ACID POISONING.—Oxalic acid poisoning is usually the result of the domestic cleaning substance, salts of lemon, having been taken in mistake for something else. As this very dangerous substance is indistinguishable in appearance from bicarbonate of soda, baking-powder and other harmless white powders, it should never be bought in a larger quantity than can be used immediately and should never be left lying around. *Treatment:* Give no emetic, but make the patient drink water into which chalk or lime has been mixed. If these substances are not at hand, strip some whitewash or plaster off a wall or ceiling. Follow with a dose of castor oil and keep the patient for three or four days on milk and lime water.

OZÆNA.—Unpleasant smell from the nose, due to crusting of the nose where there is lack of mucous secretion. It is probably due to an infection.

PALPITATION OF THE HEART.—The healthy person is usually unconscious of the beating of his heart. When he cannot help perceiving his heart's action, and feels it to be irregular, rapid or too strong, he is said to have "palpitations." In only a small proportion of cases is the palpitation due to serious organic disease. It is usually found in nervous subjects, and at a time of extra excitability of the nervous system, such as puberty, during menstruation and the menopause, or in lowering states as anæmia, neurasthenia, hysteria and dyspepsia. Fright or over-exertion brings on palpitation, and the taking of too much tea, coffee, tobacco or alcohol. In any of these cases no treatment is required beyond preventative treatment, and lying down in a darkened room will usually cure an attack. If the palpitations are due to organic heart disease, they are of much greater significance. The difference will be known from the fact that there will be other heart symptoms such as blueness of the lips, swelling of the legs, etc., and the condition will be more continuous.

PALSY.—Another name for paralysis.

PANCREAS. — The sweetbread. An organ near the stomach and associated with the digestive system. A disorder of part of the pancreas is the cause of diabetes.

PANCREATITIS.—Inflammation of the pancreas. In acute form it is a rare disease and is usually fatal. Mild disturbances of the pancreatic function must not be confused with it, as they are of little significance.

PAPILLOMA.—A warty tumour, not malignant.

PARALYSIS.—Loss of sensation or of the power of movement. This is due to disease or injury affecting the brain, spinal column or nerves. *Hemiplegia* is the form of paralysis where the whole of one side of the body is paralysed. The disease in this case is in the opposite half of the brain. *Diplegia* is the complete paralysis of both sides of the body and all four limbs. It is usually due to injury at birth or is the result of *infantile paralysis*. *Paraplegia* means paralysis of both lower limbs, and is due to disease of the lower part of the spinal column.

Paralysis is more a symptom of disease somewhere in the nervous system than a disease in itself. The commonest form in which it appears is hemiplegia, which often follows an apoplectic stroke, and usually comes on in elderly people. If the individual gets over the attack there may be partial or even complete recovery of the paralysis. The face recovers first, then the leg and lastly the arm. There may be considerable rigidity and contractures may develop. To

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

combat these symptoms, passive movements of the limbs should be performed after a month from the beginning of the illness. The faradic current may be used to stimulate muscles and the patient should try to use the limbs as much as possible himself.

In paraplegia the lower part of the abdomen may be involved, in which case there may be incontinence of urine and the patient may have to wear a urinal, or there may be retention and a catheter will have to be used.

If control of the bowel is lost, a daily enema of soap and water will help to keep the patient more comfortable.

If the paralysis is due to an injury the outlook is more hopeful than when it is the result of disease. If due to injury at birth, operative measures may help to remedy the injurious after-effects.

PARALYSIS AGITANS.—*See* SHAKING PALSY.

PARALYSIS, FACIAL.—*See* FACIAL PARALYSIS.

PARAPLEGIA.—Paralysis of the lower extremities. (*See* PARALYSIS.)

PARATYPHOID FEVER.—An acute infection caused by a bacillus closely resembling the typhoid bacillus. The disease closely resembles typhoid fever, but is much milder in its effects. There is inflammation of the mucous lining of the bowels, but not extensive ulceration as there may be with typhoid. There is an incubation period of ten days after the individual has been subjected to infection, then there will be a rise in temperature with headache and pain in the abdomen. There may be bronchitis. The patient becomes very apathetic and suffers severely from headache. The rash in paratyphoid fever is usually not very definite and consists of a few spots on the abdomen.

Treatment.—Careful nursing is more important than drugs in typhoid or paratyphoid fever, and the diet is of the utmost importance. The patient must remain strictly confined to bed until convalescence is well established. The diet should be a liquid one, milk in any form, cream, tea, coffee and cocoa, strained soups, eggs raw or soft boiled, gruel and jelly. Later, soft food may be added. Milk sugar should be given too as a substitute for carbohydrates in order to maintain the patient's strength. The mouth must be carefully sponged out after each feed. This disease is notifiable, and is normally treated in hospital.

PAROTITIS. — Inflammation of the parotid gland. Mumps is an infectious form of parotitis.

PARROT FEVER OR PSITTACOSIS.—A fatal form of disease amongst parrots which may spread to man, and of which cases have been reported in the British Isles of recent years. The symptoms resemble those of typhoid fever or pneumonia. Treatment follows on the same lines as for those diseases.

PARTURITION.—The act of giving birth to a child. (*See* CHILDBIRTH.)

PASTEURIZATION.—The process of checking fermentation in milk or other liquids by heating to a temperature of about 140°-160° F. for twenty to thirty minutes.

PEDICULOSIS.—LOUSINESS. A skin trouble due to the presence of lice or pediculi. These troublesome parasites spread very rapidly from person to person. They take up their abode most commonly in the hair of the head, but are liable to find their way to other hairy surfaces of the body in people who are dirty.

The simplest form of treatment is to cut the hair short, soak the hair with paraffin, covering the wet hair with a wrapping of cloth or a bathing cap at night. If this is done for three nights running, and the hair is thoroughly washed each day in between, the trouble should be overcome. Infested clothing may be heated in the oven. The up-to-date treatment is by using D.D.T.

PELLAGRA. — A curious deficiency disease more common in tropical countries but not unknown in the British Isles, where cases have in the past been not uncommon in asylums. The disease usually makes its appearance in people between twenty and forty years of age and is more common in women than in men, and once established is liable to annual reappearances of increasing severity.

The patient is, as a rule, attacked in the spring with headache, weakness and depression. The mouth becomes sore and ulcerated. There is a loss of appetite and vomiting. Diarrhœa with bloody stools may alternate with constipation. There is a peculiar puffiness of the skin and the skin becomes brown and darkened. There are marked nervous symptoms.

The disease is now known to be due to shortage of the vitamin B-complex, and can be arrested or cured by administration of this substance.

PELVIS.—The pelvis is the space contained within the haunch bones which join together in front, and the sacrum behind. It contains the lower part of the large intestine, i.e. the pelvic colon and rectum, and also the urinary bladder, and in the female the womb and ovaries. Close to the brim of the pelvis go the great blood-vessels from the abdomen to the lower limbs.

PEMPHIGUS.—A disease of the skin characterized by the appearance of blisters which on subsiding leave pigmented areas. There may be pain and itching. The disease may be either acute or chronic.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PENICILLIN.—This is an extract of the mould *Penicillium notatum*, which has very high bacteriostatic properties. Serum, blood and pus do not interfere with its action, and it apparently has no toxic effect. It is one of the most useful medical discoveries of the present day and it has been used with great success against many serious infections, including pneumococcal and gonococcal infections.

PEPTIC ULCER.—Includes ulcer of the stomach or of the duodenum.

PERFORATION.—A hole made through the wall of an organ, commonly the stomach or intestine.

PERICARDITIS.—Inflammation of the pericardium, the closed membraneous sac which surrounds the heart. (*See* HEART DISEASE.)

PERIOSTEUM.—The fibrous membrane covering bones, except where they join with other bones and there is cartilage.

PERIOSTITIS.—Inflammation of the periosteum. (*See* BONES, DISEASES OF.)

PERITONITIS, ACUTE. — Inflammation of the peritoneum, the thin membrane which lines the walls of the abdomen and forms a covering for the organs contained in the abdomen and the pelvis. Peritonitis is usually secondary to perforation of one of the organs covered by the peritoneum, or due to an extension of infection from them, or may follow an external wound such as an operative wound. There is intense pain, usually above the umbilicus, and chilly feelings or a rigor. The temperature rises rapidly. Vomiting soon begins, and the patient becomes very ill. The treatment consists in operation at once, in order to save the patient's life.

PERITONITIS, CHRONIC. — Chronic peritonitis is nearly always tuberculous, and treatment must be as for tuberculosis.

PERSPIRATION, OFFENSIVE.—*See* SWEAT, OFFENSIVE.

PERTUSSIS. — Another name for whooping-cough.

PES CAVUS.—Club-foot.

PETIT MAL.—*See* EPILEPSY.

PHARYNGITIS.—May be acute or chronic and is inflammation of the part of the throat immediately beyond the mouth, usually due to septic tonsils or an affection of the nose. An iodine paint, Mandl's paint, is usually sufficient to clear up the condition.

PHIMOSIS.—Contraction of the aperture of the penis. (*See* CIRCUMCISION.)

PHLEBITIS. — Inflammation of the veins, usually accompanied by clotting of the blood in the vein. It may occur after surgical operations and is frequently a complication of varicose veins. The affected limb is tender and subject to aching and shooting pains. The part surrounding the vein becomes swollen and an abscess may form. There may be bad cramp. Phlebitis is chiefly dangerous because of the risk of a clot becoming detached and travelling to some vital organ such as the heart, when it may cause sudden death. The patient therefore must be kept in bed entirely, until all signs of inflammation have disappeared. The diet should be light. It may be necessary to wear an elastic bandage for support after phlebitis if the limb is still swollen. A useful drug in cases of phlebitis is extract of horsechestnut, a French preparation.

PHOBIAS.—*See* OBSESSIONS.

PHOSPHORUS POISONING. — An emetic should be given, followed, after the stomach has been emptied, by the white of an egg. The antidote is 5 grs. of sulphate of copper given repeatedly in water. A dose of castor oil, Epsom salts or other purgative may be given.

PILES.—Hæmorrhoids or piles are a varicose condition of the veins of the lower portion of the rectum and the anus. The expression "an attack of piles" means an attack of inflammation in these veins. Hæmorrhage when the bowels move should lead one to suspect the presence of piles and an examination should be made, especially in the case of an elderly person.

Piles may be external or internal. External piles appear as tags of skin outside the anus and do not cause many symptoms unless they become chafed or infected, when they cause great pain and discomfort for several days.

Internal piles, however, have no very marked symptoms until they begin to bleed, but they may protrude from the anus and if not pushed back with the finger will become bruised and acutely painful. Chronic constipation, sedentary occupation, alcoholic excess and pregnancy are the most usual causes of piles. To cure them, constipation must be rectified by diet and drugs if necessary.

The parts should be kept scrupulously clean, using cotton-wool instead of the ordinary paper, and smearing with a soothing and astringent ointment. If they do not disappear with improved habits and hygiene, they may be injected with carbolic in gylcerine by a doctor. Operation is advised only in the most intractable cases.

PIMPLES.—The usual cause of a pimply skin is acne. Isolated pimples may indicate that a tonic is needed.

PINK EYE.—A slight form of conjunctivitis, which may break out in epidemic form in schools.

PITUITARY GLAND.—*See* GLANDS.

PITUITRIN.—Name of a preparation made from the pituitary gland. (*See* ORGANOTHERAPY.)

PLACENTA.—The organ by which the embryo is attached to the wall of the womb

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

by means of the umbilical cord, and through which it receives its nourishment. It is expelled from the womb after the child is born and is, therefore, popularly called the *afterbirth*.

PLAGUE, or bubonic plague, is nowadays found only in the East, especially India and China, though occasional cases come from the East and are found in European seaports. It is apparently the same disease as was known in medieval times as the Black Death, and the most famous outbreak in England was the Great Plague of London in 1664-1665, when over 70,000 inhabitants (out of 460,000) of the city died of it. It is really a disease of dirt and neglected sanitation, and our immunity today is due to improved hygiene; it is now known to be caused by a germ, the *bacillus pestis*, which is conveyed by the fleas on rats.

PLASTERS.—The two plasters most generally used are mustard plaster and belladonna plaster.

PLEURISY is an inflammation of the membrane which is the outer layer of the lung. The first symptom is usually a severe stabbing pain in the side, which is much worse when a deep breath is taken. It is often a complication of pneumonia, and recurrent attacks of pleurisy give rise to suspicions of tuberculosis of the lung. In pleurisy with effusion there is a large effusion of serous fluid into the cavity of the chest (within which the lungs lie, closely applied to its walls); in this type there is less pain, but the patient is bluish and breathlessness is more marked; the fluid usually has to be drawn off with a hollow needle. In dry pleurisy the affected part of the chest is kept at rest by strapping or painted with iodine, or a small fly-blister is applied. Sedative medicines are given by the doctor. The temperature is always raised and the patient must be in bed, as the condition is looked upon as quite a serious one and more serious complications (such as pneumonia or empyema) may develop.

PLEURODYNIA.—Rheumatism in the intercostal muscles. (*See* SIDE ACHE.)

PNEUMONIA, or inflammation of the lung, takes two forms, *broncho pneumonia*, which is an extension of bronchitis and affects the lungs in patches throughout the lung, and *lobar pneumonia*, in which one lobe or portion of one lung is affected—in double pneumonia one or more lobes of both lungs are affected. Broncho pneumonia is more common in children and lobar pneumonia (which is caused by a germ, the pneumococcus) is more common in men than in women, probably because they are more exposed to the weather, pneumonia being more frequent in the winter and spring. Alcoholic habits undoubtedly predispose to pneumonia. The death-rate is higher among persons who habitually take alcohol. The patient usually complains of a pain in his side, a chill, a cough with blood-stained "rusty" sputum, and he has a high temperature and a quick pulse and feels ill. About the eighth day of the illness there is usually in lobar pneumonia what is called a "crisis," and the temperature and pulse fall to normal. Skilled nursing is the chief essential in treatment. The drug M and B 693 is the most modern and effective treatment.

POISONS and POISONING. — Acute poisoning is dealt with here, notably cases where a lethal dose of poison has been swallowed either accidentally or of set purpose. When the condition is discovered, send someone at once for the doctor, but do not wait for his arrival before beginning measures. In every case where the lips and mouth are not burnt, showing that a corrosive poison has been taken, give the patient an emetic (*see* EMETICS) and repeat the emetic until the stomach is shown to be empty by the water returning clear of food substances. A large dose of castor oil should then be given and, if the poison is identified, the appropriate antidote. If the patient shows signs of asphyxiation, artificial respiration should be applied, or if there is much shock, combat it with heat applied by hot-water bottles, blankets, etc. If the patient shows a tendency to go to sleep he should be walked about or otherwise kept awake until the doctor arrives. In cases where a corrosive poison has been taken, no emetic must be given, but oily drinks may be taken, also white of egg or milk. Bicarbonate of soda in large quantities is useful.

In all cases of acute poisoning it should be remembered that everything must be left as it is found. No bottles or dishes must be removed or cleaned, and all vomit, etc., must be kept for inspection. Even if it is not a case for the police, the doctor will want to see them.

Antidotes, *Acids.*—Acetic, hydrochloric, nitric, sulphuric—give magnesia, chalk, lime-water. Give no emetics.

Carbolic acid.—Epsom salts.

Prussic acid.—Emetics, atropine, tincture of belladonna.

Alcohol.—Emetics, coffee.

Ammonia, lime, potash, soda. — No emetics. Vinegar, orange or lemon juice, citric acid.

Arsenic.—Emetics, soapy water.

Aspirin.—Emetics, brandy.

Chloral.—Emetics, brandy, strychnine, nux vomica.

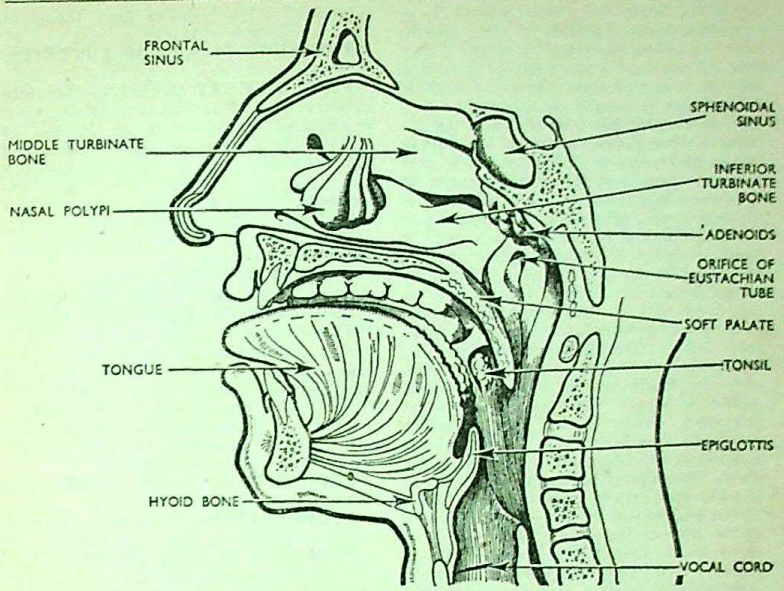
Cocaine.—Emetics, brandy.

Strychnine.—Emetics, charcoal, bromide of potassium, chloroform.

Veronal.—Emetics, coffee, strychnine; keep the patient awake at all costs.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Section through the nose, showing the nasal polypi and adenoids, which are present only in disease. It may be found beneficial to the patient if the polypi are removed

POLIOMYELITIS, ACUTE.—*See* INFANTILE PARALYSIS.

POLYPUS, NASAL.—A growth which occurs inside on one or both sides of the nose. There is a watery discharge and breathing, and sometimes hearing, are obstructed. Removal of the polypi, which is a simple matter, may make a great difference to the patient's health and mental outlook.

POLYURIA.—The passing of an excessive amount of urine. The normal amount passed in a day is about two and a half pints. Excess may be due to nervous causes, when no treatment is needed, or to serious organic disease, such as diabetes or inflammation of the kidney. There may be temporary polyuria after fevers.

PORT WINE STAINS.—*See* BIRTHMARKS.

POTT'S DISEASE.—Caries of the vertebræ. (*See* SPINAL CURVATURE, ANGULAR.)

POTT'S FRACTURE.—Fracture of the fibula above the ankle joint. (*See* FRACTURES.)

POULTICES.—Poultices are not so much used now as they were formally, because antiphlogistine is so much easier and safer to apply. But as this is not always at hand when wanted, poultices have still frequently to be made. The commonest in use are made of bread, linseed and mustard.

Bread Poultice.—Stir a sufficient amount of breadcrumbs into boiling water, well beat and cover and put the bowl in a pan of boiling water until the bread is well swollen. Drain off the water, and spread evenly over a piece of linen or cotton. Turn the edges neatly in, spread with olive oil or cold cream and apply to the part. Try one corner first and lay on as it gets cool enough for the patient to bear it. Cover with flannel or oiled-silk and bandage on. Do not leave poultices on for more than four hours and have the new poultices ready to go on before removing the first.

Linseed Poultices are made in a similar fashion, but the linseed meal must be sprinkled gradually into the boiling water and well stirred to avoid lumps. *Mustard poultices* are linseed poultices with the addition of a couple of tablespoonfuls of mustard.

PREGNANCY.—The state of being pregnant or with child. The earliest symptom of pregnancy is the stoppage of the monthly periods. The child's birth may be expected nine months and one week from the first

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

day of the last period. Some women, however, have reduced periods for three months after conception has taken place, and if they have not noticed the scantiness of the period they may miscalculate when the birth is due. There is usually no doubt, however, after quickening has been observed. Quickening is when the movements of the child in the womb become so strong that the mother observes them, and this usually occurs at four and a half months. After the cessation of the menses, or periods, the next symptom to be noticed is "morning sickness." A small quantity of clear tasteless fluid is vomited each morning on rising. There may be no feeling of nausea, the fluid being simply brought up. Sometimes this happens in the evening instead, but once a day is the rule, and if there is persistent vomiting during the day or if the condition continues after the fourth month, a doctor's advice should be sought. The next symptom of pregnancy occurs in the breasts, which swell and may be painful. The veins are fuller and show blue and extended on the chest. The nipples become more prominent and the area around them becomes stained brown with raised white pimple-like bodies at the edge of the stain. During the first three months there may be a frequent desire to pass water. This disappears and its return later usually signifies that the end of the pregnancy is within ten days. In the later stages of pregnancy there is a brown line running downwards from the umbilicus, or navel, and there are usually lines of stretching on the abdominal wall which remain permanently as faint white scars after the birth. These are called striae. They may also be caused by any disease with great distension of the abdomen. During pregnancy there may be either constipation or diarrhœa, the digestion may be troublesome and there may be heartburn or waterbrash. The woman may have a dislike for certain articles of food and a longing for others.

The weight of the abdomen may also cause swollen legs with varicose veins. There may be great trouble with itching of the genital organs, and some women have a heavy white discharge. These conditions, together with the more serious ones of albuminuria and high blood pressure, can be diagnosed and appropriately treated by routine visits to a doctor or the ante-natal clinic. As bleeding may herald a miscarriage, this, however slight, should be reported at once. (*See* CHILDBIRTH, ECLAMPSIA.)

PRESBYOPIA.—Old sight. (*See* SIGHT, DEFECTS OF.)

PRESSURE PALSY.—Loss of power or sensation in a limb owing to pressure on the part. The use of the limb usually returns in a few hours or days, though it may take longer in elderly people.

PRESSURE POINTS OF ARTERIES.—*See* HAEMORRHAGE.

PRICKLY HEAT (Miliaria).—An acute inflammation of the sweat glands, most common in summer or in the tropics. It consists of a crop of small bright red pimples which come out after perspiration and are very irritable. Dust with bicarbonate of soda or a good dusting powder and drink magnesia, fruit salts or any cooling drinks. Moderate the diet. Alkaline baths are comforting.

PROCTITIS. — Inflammation of the rectum. (*See* BOWELS, INFLAMMATION OF.)

PROGRESSIVE MUSCULAR ATROPHY.—Gradual wasting of the muscles, due to degeneration of the spinal cord or brain. The disease begins in middle or old age and the patients become extremely wasted. The only treatment is to try to improve the general condition by massage and remedial exercises, cod-liver oil and tonics of arsenic or strychnine.

PROLAPSE OF THE WOMB.—*See* WOMB, DISPLACEMENTS OF.

PROPHYLAXIS.—Measures to prevent the development and spread of disease.

PROSTATE GLAND, ENLARGED.—The prostate gland, near the neck of the bladder in males, often becomes enlarged in later life, and if it interferes with the passing of urine will require removal. Some men may avoid operation by keeping the urine bland by abstaining from eating rich food and drinking much fluid, but alcohol must be given up. A catheter may have to be used regularly.

PROTEINS.—*See* FOOD.

PROTOZOA.—Plural of protozoon, the lowest form of life, consisting of simple cells or groups of cells. Protozoa are the cause of certain diseases in the human body, such as malaria.

PRURIGO. — Chronic inflammatory disease of the skin with small pimples and severe itching. The condition may start in childhood and usually recurs each year. Treat the itching. X-rays, radium and electricity have been used with benefit.

PRURITUS.—*See* ITCHING.

PRUSSIC ACID POISONING.—Hydrocyanic or prussic acid is almost immediately fatal. The breath smells of almonds. Give an emetic if possible and start artificial respiration.

PSORIASIS.—Skin disease with reddish patches covered with white scales. Baker's itch and washerwoman's itch are forms of psoriasis. There is severe itching. If the disease is not treated it may last for years, and even if it is treated it is liable to recur. The scales should be softened by soaking in warm water, or covering with oil or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vaseline. They can then be removed and the red areas covered with cold cream or olive oil. Sulphur baths are useful and arsenic may be taken internally.

PSYCHASTHENIA. — Mental fatigue, shown by inability to regulate one's ideas and actions in a reasonable manner, by lack of the power of concentration and the development of obsession. (*See* OBSESSIONS.)

PSYCHO-ANALYSIS. — A form of psychotherapy in which the physician tries, by extensively questioning the patient, to discover the cause of the mental disorder by searching into the depths of the patient's mind. It is a very slow and laborious method, though in many cases it has proved useful to the patient.

PSYCHOTHERAPY. — Treatment, by mental influence, of disorders due to mental causes. Suggestion, hypnotism and psycho-analysis are the chief methods in use in psychotherapy.

PTOMAINES.—*See* FOOD-POISONING.

PTOSIS.—A term used for the falling of any organ of the body, but often of the eyelids alone. (*See* EYELID, UPPER, DROOPING OF; VISCEROPTOSIS.

PUERPERAL FEVER. — Childbed fever, as it is commonly called, is an acute form of blood poisoning which attacks women after childbirth. The infection is by germs which are carried to the mother by someone in attendance on her, or she may infect herself. They enter the blood direct from one of the raw surfaces caused by parturition. The disease is a serious one and the death rate is still too high, though proper methods of asepsis are reducing it, and if proper antiseptic precautions were invariably taken it would be stamped out almost entirely.

PUERPERAL INSANITY. — Insanity after labour arises from the same cause as during pregnancy or at any other time. The patient has a nervous and unstable system to start with and it is overstrained by the emotion and physical exhaustion associated with her condition. Most cases recover, but others may pass into hopeless insanity. The baby must be weaned and the mother kept under constant supervision. Fresh air, nourishing food, freedom from worry, and tonics are needed.

PULMONARY TUBERCULOSIS. — Tuberculosis of the lung. (*See* TUBERCULOSIS.)

PULSE.—The pulse is the change in tension in the wall of an artery due to the contractions of the heart. The impulsion of blood along the arteries can be felt where an artery comes near the surface of the body, as at the wrist. To take the pulse, hold a watch with a seconds hand in the left hand while the fore, middle and ring fingers of the right hand are placed about half an inch from the outer side of the patient's forearm. The pulse beats are counted for a minute. At the same time notice the quality of the pulse, whether it is full and bounding, rapid and thin or feeble and soft. A rapid pulse occurs in fevers, heart failure and nervous disorders. A slow pulse is found in some sorts of heart disease, or convalescence after high fevers. An irregular pulse is one where some beats are felt more strongly than others. This may be the case in digestive troubles, where it is a temporary condition. In the intermittent pulse one or two beats may be missed. Like irregular pulse it may be present in heart disease, but it may also be due to indigestion or anything which upsets the nervous system, such as over-indulgence in alcohol, tea, coffee or tobacco.

PUPIL.—Aperture in the coloured part of the eye (iris) through which the light passes.

PURPURA.—Patches which are the result of bleeding into the skin. This condition may be the result of other diseases such as blood-poisoning, infectious fevers, etc. If it occurs alone with nothing to account for it, it is regarded as a separate disease, though there still must be some unknown condition to account for it. The treatment consists of rest. Tonics and calcium may be tried.

PYÆMIA.—A very serious condition in which pus-forming germs are present in the blood, causing abscesses in different parts of the body. The treatment is the same as for blood-poisoning.

PYONEPHROSIS.—Pus in the kidney. (*See* HYDRONEPHROSIS.)

PYORRHŒA ALVEOLARIS. — A disease of the gums which may cause serious upset to the general health by the constant swallowing of the poisons discharged into the mouth from the gums. It is due to microbic infection, and attacks all ages and conditions of people, but those in good general health with carefully tended mouths will not be likely to be seriously attacked. The teeth should be put in order by a good dentist and antiseptic mouth-washes used. If this is not sufficient to clear up the condition, vaccines may be tried, and if they fail it may be necessary to remove the teeth, but this should only be the very last resort.

PYREXIA.—Temperature raised above normal. Fever.

PYROSIS.—Heartburn.

QUARANTINE.—In the old days if a ship came into harbour with a case of an infectious disease on board, the crew and passengers were quarantined, or detained, for about forty days. This state no longer exists in Great Britain. As soon as a ship comes into harbour the customs officer is the first to board her, and the captain presents

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

his Bill of Health. If this is not "clean," which means that infectious disease is on board, all the passengers are medically examined before they are allowed to land. Names and addresses are also taken and forwarded to the sanitary authorities of the various districts so that everyone may be kept under observation until the incubation period has expired. All cases are removed to hospital if possible, and before it is allowed to leave its moorings the ship is thoroughly disinfected.

In domestic circles, quarantine is carried out under observation. If the patient is removed to a hospital, the house is disinfected and it is only necessary that the rest of the household should remain under observation until the incubation period is over. (*See* INCUBATION PERIODS.) During the quarantine no person from the house should be employed in the milk trade, nursing, washing or in any trade in which food is handled. Visitors should not be allowed, and the most rigid precautions taken to prevent the spreading of the disease.

QUICKENING.—*See* PREGNANCY.

QUININE.—A bitter substance obtained from the bark of various species of cinchona; formerly used in malaria, in which disease it has a specific action. It is also used as a stimulant to the nervous system, and during fever it is strongly antipyretic. It was formerly known as Peruvian bark.

QUINSY.—An acute suppurative condition of the tonsils, sometimes following chronic tonsillitis, or it may be the result of exposure to cold or wet; it occurs most frequently in young persons. The temperature may rise to 102° or even 105° F., and prostration may be extreme. The patient finds great difficulty in swallowing and the throat is very dry and sore. One or both tonsils may be involved. The glands of the tonsils may swell to such an extent that they meet in the middle line, or one tonsil may even push the uvula aside. The breath is offensive and the tongue coated with fur. The abscess points usually toward the mouth, but in some cases backwards toward the pharynx.

Treatment.—Hot poultices or fomentations should be applied to the throat, and the mouth and throat may be cleansed by syringeing. The bowels must be kept open. The patient may be spared days of suffering if the abscess is incised early. In some cases the tonsils may swell to such an extent that suffocation is threatened; in such cases the tonsils must be excised. Patients with this affection require a very nourishing liquid diet and during the convalescence period a tonic of iron should be given in full doses.

RABIES.—*See* HYDROPHOBIA.

RADIANT HEAT.—Energy emitted by all bodies in proportion to their temperature. If the body is over 600° C. it radiates light as well as heat.

RADIUM TREATMENT.—This rare element was isolated by M. and Mme. Curie. It has the power of emitting energy which is derived from the breaking down of the atomic structure, and is such that it could boil its own weight of water every hour, and even then it would be over 1,600 years before its energy would be halved.

It gives off rays, one of which resembles the X-ray, and radium has therefore a similar therapeutic action to X-rays. It is most useful in cancerous growths such as rodent ulcer, sarcoma, etc. It will reduce the size of a growth so that one regarded as inoperable can be dealt with surgically. It will soften and relieve the pain of tender scar tissue and benefit chronic skin diseases, such as lupus vulgaris, etc. Applied to the ovaries, it is of value in climacteric affections.

An emanation of radium, known as radon, can be inserted round a growth in the form of radon seeds. These seeds can be left in the patient indefinitely, as their action is definitely limited and the dosage is thus accurately defined.

RAYNAUD'S DISEASE.—This occurs in any climate, but resembles the effects of extreme cold. Fingers and toes are usually affected symmetrically. It is due to a more or less complete arrest of the capillary circulation of the extremities and may end in dry gangrene. In severe cases the ears and nose are included. Chilblains are a mild form of this disease.

Treatment consists of wrapping the part affected in cotton wool and soaking the extremities in warm water (98°-99°) morning and evening. Tonics and fats in the diet are important. Attention to the general health and a good nourishing diet are also important. Calcium and parathyroid gland medication are employed in selected cases, but electrical treatment is usually most efficacious. The patients are warned to wear wool- or fur-lined gloves and shoes in cold weather and to avoid undue exposure to cold. Wintering in a warm climate is usually a complete preventive.

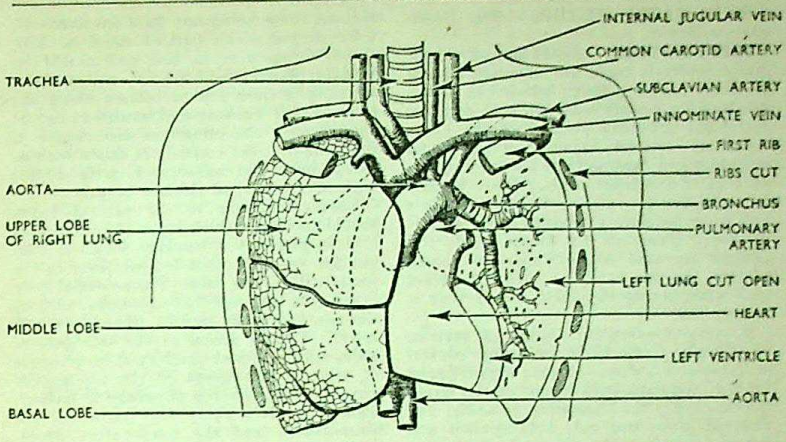
RECURRENT MANIA AND MELANCHOLIA.—*See* INSANITY.

RED-GUM.—A red papular eruption of infants accompanied by acute itching, usually due to stomach trouble; or it may be due to too much clothing, especially of a woollen nature.

The treatment is chiefly preventive; a soothing lotion for the skin, such as calamine lotion, and the bowels cleared by an occasional grain of grey powder.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Diagrammatic illustration of the thorax, showing the principal parts

RELAPSING FEVER.—An acute infectious disease due to a germ. There is an incubation period of 5-7 days and the disease starts with a chill, fever, pains in the back and limbs. Sweats and delirium occur and the symptoms continue for 5-6 days and suddenly cease. After a variable interval, usually about a week, a second paroxysm occurs, and this may be followed by a third and a fourth. It occurs chiefly where conditions of overcrowding and defective food supply exist, and must be prevented by improved sanitation and good food and the use of insect powders.

RELAXED SORE THROAT. — *See* LARYNGITIS; PHARYNGITIS.

RENAL COLIC.—Pain due to the presence of a stone in the ureter.

RESPIRATION (Breathing).—An interchange between the gases of a living organism and the gases of the medium in which it lives. This occurs via the lungs in the human being and is slightly assisted by the skin (this plays an important part in some animals, such as the frog).

Respiration consists of two acts: inspiration, or the taking in of air, and expiration, the expelling of the air that has been used. Oxygen is absorbed and carbon dioxide is given off in proportion. Inspiration is due to the contraction of the muscles of the chest and of the diaphragm. The chest muscles expand the ribs and the diaphragm presses down the organs in the abdomen; this results in a negative pressure inside the lungs which is relieved by air passing through the respiratory passages of the nose or mouth. The lungs are lined by a membrane called the pleura between them and the chest wall, and the inner surfaces of the pleura are lubricated by serous fluid which allows the respiratory acts to take place without unnecessary friction. In expiration the muscles relax and allow the ribs to contract by virtue of their own elasticity, and the viscera push the diaphragm up into the thoracic cavity. Air is driven out of the lungs till the pressure inside equals that of the surrounding atmosphere. In the uttermost recesses of the lungs the air is only separated from the red blood cells containing the hæmoglobin by a layer of cells, and the interchange of gases is effected through the cells. (*See* ARTIFICIAL RESPIRATION.)

REST CURE.—A method of treatment most successful in cases of nervous exhaustion (*see* NEURASTHENIA). It was devised by Dr. Weir Mitchell and consists of absolute rest in bed, massage, electrical treatment and administration of abundant food, especially milk.

RETENTION OF URINE.—*See* URINE, RETENTION OF.

RETINA.—The membrane of the eye representing the terminal expansion of the optic nerve or "nerve of sight."

RETROFLEXION. — A condition in which the uterus is bent backward upon itself, producing a sharp angle in its axis. This often causes painful periods and even sterility.

RETROVERSION.—The uterus here is tilted backward. This often occurs after childbirth or after a miscarriage, and is liable to give rise to bladder troubles unless corrected, either by means of a pessary or by surgical operation.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RHEUMATIC FEVER. — *See* RHEUMATISM, ACUTE.

RHEUMATISM, ACUTE, or rheumatic fever, is an acute infection almost certainly due to a germ which has a predilection for smooth surfaces, such as those round the articular surfaces of the joints (synovial membranes) and the one round the heart (pericardium) and those lining the cavities of the heart itself. These become inflamed and give rise to the swollen joints and heart troubles so characteristic of this disease. Exposure to damp, cold and fatigue are said to be important causal factors, but the rarity of rheumatic fever in France during the First World War is noteworthy.

Symptoms.—General feeling of malaise or ill-health; attacks of sweating, general stiffness of joints, sore throat; soon followed by the rheumatic pain in one of the larger joints, usually the knee, wrist or ankle. The affected joints are red, hot, swollen and intensely painful. Frequently the inflammation subsides rapidly in one joint, only to appear in another. The temperature is usually high, about 103° F., and varies with the intensity of the arthritis. The tongue is very dirty and covered with a fur so thick that it is known as the "blanket tongue." Urine is highly concentrated and full of deposit.

Complications.—The most serious are those affecting the heart:

(*a*) Endocarditis—inflammation and permanent damage to the valves which regulate the blood flow.

(*b*) Pericarditis—inflammation of the membrane surrounding the heart and resulting in fixation of the heart muscle against the chest wall.

(*c*) Myocarditis—inflammation of the heart muscle, leading to a permanent weakness of the heart with consequent chronic invalidism.

(*d*) Pleurisy — inflammation of the pleural membranes.

(*e*) Hyperpyrexia — excessively high temperature (over 106°); the patient is often delirious, or may be comatose.

(*f*) Skin eruptions—a fine rash due to excessive sweating is common.

(*g*) Tonsillitis—very often associated with acute rheumatic fever; it is believed that the entry of the germ causing it is often via the tonsils; their removal often prevents a recurrence.

(*h*) Fibrous nodules — often develop under the skin over the bony ridges.

The disease is rarely fatal and the severe symptoms usually subside in a fortnight; on the other hand, no disease is more often attended by grave relapses and serious results, especially in regard to the heart. In children the heart may be affected without there being any joint involvement.

Treatment.—The patient must be kept absolutely at rest in bed and should lie between blankets and wear a woollen night-shirt, split from top to bottom along the front so that washing and treatment can be applied with the minimum disturbance of the patient. Diet consists of fluids such as lemon juice and soda-water, milk diluted with soda-water, or chicken broth.

Local treatment to the painful joints should include a thick layer of cotton wool kept in place by a bandage which is firm but not too tight; hot fomentations to the joints will relieve pain. The essential drug is salicylic acid and its compounds, such as the one known as aspirin (the acetic acid ester). Twenty grains of the salicylate of soda, with an equal quantity of bicarbonate of soda, a few drops of the tincture of ginger or of the syrup of orange to flavour, should be given every four hours till the pain ceases and the temperature drops. Aspirin can be given in 5-15 grain doses for an adult, or 3-5 grains for a child, dissolved in water or milk. The pain may be so intense that some preparation of morphia is required. Rest in bed for several weeks after the acute symptoms have subsided is essential to avoid heart complications, and if fibrous nodules are present the rest in bed must be continued till these have disappeared.

In children the joint involvement may be so slight as to be regarded as "growing pains," while the heart may be seriously damaged before the disease is recognized. Complications, especially chorea, are more common.

The treatment for children is the same as for adults, but rest in bed is even more important to avoid permanent damage to the heart. During convalescence tonics and a vitamin-containing food, such as cod-liver oil, are most useful.

RHEUMATISM, CHRONIC.—A disease which affects the fibrous tissues of the body. It rarely follows acute rheumatism. The capsules and ligaments of the sheaths of the adjacent tendons and the sheaths of the muscles may all be implicated. These structures may become thickened and inflamed and the movements of the joints limited, although there is but little deformity.

Symptoms. — Pain and stiffness, especially in the morning. Continued exercises tend to alleviate the pain.

Treatment is unsatisfactory; local measures include counter-irritation, massage, hydro-therapy and electric treatment. A course at a spa and a warm winter climate are also most useful.

RHEUMATISM (MUSCULAR), MYALGIA.—A painful affection of the voluntary muscles and their fibrous attach-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ments. The disease often results from overstrain or exposure to cold and damp, and is most probably due to inflammatory changes in the muscular fibrous tissues. According to the muscles affected, so different varieties are described :—

(*a*) Lumbago—involving the muscles over the lower part of the back. The pain is often intense and may make walking difficult. It is often due to some physical exertion such as getting into a saddle or lifting a heavy weight. (*See* LUMBAGO.)

(*b*) Pleurodynia—involving the sheaths of the muscles covering the chest wall; not to be confused with pleurisy.

(*c*) Muscular torticollis, in which the muscles of the neck are affected.

Treatment consists of rest to the affected muscles, as by strapping over the skin; heat in all forms is very beneficial.

RHEUMATOID ARTHRITIS. — This condition usually affects females between twenty and forty. There are swelling and pain over many of the joints, chiefly due to the structures around. There is slight rise of temperature It may result in severe deformity and loss of function.

Treatment is unsatisfactory: relief of pain may be obtained by local application of heat and counter irritation, as by hot fomentations and plasters—mustard or belladonna. Preparations of gold and aluminium are beneficial in some cases.

RICKETS (Rachitis).—This is a nutritional disorder occurring chiefly among the poor of overcrowded cities as a result of improper feeding, want of sunlight, and other bad hygienic conditions. A deficiency in animal fats, or more accurately vitamins A and D, will result in rickets developing. Rickets is a disease which is disappearing in most civilized countries.

The disease develops gradually. The bones become soft generally and this results through normal effects of weight, etc., in leading to deformities: the bending of the tibiæ, alterations in the pelvic bones, changes in the spinal column, a transverse groove across the front of the chest due to the pushing out of the lower ribs by the liver and intestines.

The extremities of the bones become thickened, as do the ribs at their junction with their cartilages. This thickening of the ends of the ribs gives rise to a series of knobs on both sides of the chest popularly referred to as the "rickety rosary." There are usually intestinal disturbances resulting in diarrhœa, night sweats, especially in the region of the head, and even convulsions may occur. The infant is "out of sorts," and always "whining." If the disease occurs before the age of eighteen months, the closing of the anterior fontanelle, e.g. the place where the pulsations can be felt in a baby's head, is delayed considerably.

The symptoms usually subside, but if untreated may leave deformities behind, the most important being changes in the pelvis of females, which may lead to difficulty in parturition later.

Treatment consists in replacing adequately the deficiency of vitamins A and D by the supply of cod- or halibut-liver oil or suitable extracts, or by exposing the skin to sunlight or ultra-violet light. In the presence of ultra-violet rays, a substance known as ergosterol has the power of making vitamin D. Fresh air and good healthy food are also essential.

In the case of breast-fed children, the mother's diet must be corrected and made adequate.

RIGG'S DISEASE.—*See* PYORRHŒA ALVEOLARIS.

RIGOR.—A shivering fit due to a sudden rise of temperature in the body with relative coldness of the skin, the muscles underneath contracting rapidly in an attempt to produce warmth on the surface equivalent to the internal rise. When the temperature has spread equally throughout the body, the feeling of coldness changes to one of intense heat and is followed by profuse perspiration. A rigor usually denotes the onset of a fever such as pneumonia or malaria, or the acute inflammation of some internal organ.

Treatment consists of rest in bed with many blankets and hot drinks in the first stages, followed by tepid sponging when profuse perspiration is fully established.

Care must be taken that the patient does not become chilled during this process.

RIGOR MORTIS.—Stiffening of the muscles after death, due to chemical changes and the coagulation of the muscle protein by acid. If the death is a violent one the muscles are saturated with acid produced by the exercise of the muscles and rigor mortis develops with extreme rapidity. In the case of a suicide the intense nervous strain acts in the same way as violent exercise in producing muscle fatigue due to the presence of acid, with the result that a person committing suicide is often found with his hand tightly clutching the revolver with which he shot himself. The condition lasts a few days and gradually passes off due to the formation of more acid and the solution of the coagulated protein in this excess.

RINGWORM. — A parasitic fungus affecting the skin and hair of the body. It may be contracted from animals and by using towels, hairbrushes, etc., belonging to persons suffering from the disease. Ringworm of the scalp (tinea tonsurans) usually occurs in children. It starts as a small pimple and becomes a boggy swelling

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

discharging a mucoid secretion. There is also brittleness and loss of hair. Ringworm of the hairless skin (tinea circinata) occurs as spreading, scaly patches, tending to become clear in the centre.

At the edges blisters occur and these often become infected and turn into abscesses.

Treatment consists in removing all affected hairs, and this is best achieved by X-rays which, in properly regulated doses, will remove all the hair without destroying the hair follicles. Once all the spores of the parasite on the diseased hairs have been removed, a suitable antiseptic, such as tincture of iodine, or white precipitate ointment and petroleum jelly, or sulphur and carbolic acid ointment, is rubbed into the spots with a stall-covered finger twice a day for ten minutes. Stronger remedies may be necessary, but should be applied only under medical direction.

RISUS SARDONICUS. — A peculiar grinning distortion of the face produced by spasm of the muscles round the mouth as seen in tetanus.

RODENT ULCER.—An ulcer which gradually involves and eats away soft tissue and bones. It is a form of cancer, but its rate of growth is very slow and it never produces secondary deposits in other parts of the body. It occurs most frequently at the inner corners of the eyelids and starts as a small pimple which gradually breaks down into an ulcer, which slowly becomes larger and deeper. There is practically no pain.

Treatment is by removal by radium or X-rays, or by freezing with CO_2 snow, or by surgical excision. All these methods will yield very satisfactory results in skilled hands.

RÖNTGEN RAYS.—Another name for X-rays.

ROSE RASH. — Strictly any rose-coloured eruption of the skin. Used as a synonym for rubella (German measles).

ROUNDWORM.—*See* WORMS.

RUBELLA.—*See* GERMAN MEASLES.

RUBEOLA.—Epidemic (*See* MEASLES).

RUNNING FROM THE EAR.—*See* EAR.

RUPTURE, or hernia, usually refers to the protrusion of part of the intestine or abdominal contents through the abdominal wall. The weak places where ruptures are liable to occur are:

1. At the navel or in its immediate neighbourhood (umbilical).
2. In the groin (inguinal or femoral).

The weak places are usually stretched as a result of heavy manual labour, such as the lifting of heavy weights, constant straining due to a stricture, chronic constipation or repeated pregnancies. A rupture may occur at the site of an operation where the fibrous tissue is subjected to more strain than it can stand without stretching.

A hernia is discernible as a bulge in the abdominal wall which is more marked when the patient strains, as by coughing. If the swelling can be pushed into the abdominal cavity readily, the hernia is said to be reducible; if the mass will not return the hernia is irreducible, and if the circulation in the contents of the hernia becomes interfered with it becomes strangulated.

If a strangulated hernia cannot be reduced, immediate operation is essential if the portion of the bowel is to be prevented from becoming gangrenous. The symptoms are acute pain, violent vomiting and intestinal obstruction.

In children the commonest form of hernia is the umbilical; this is due rather to a retarded development than to a definite weakness, and is treated by a truss such as can be adequately prepared at home by strapping a flat disc, such as a penny, over the swelling and keeping it there night and day, with replacements only for the sake of cleanliness, until the muscles have fully developed and the weak area has disappeared.

Inguinal hernias (ruptures in the groin) are rather more common in boys owing to difficulty in passing water through a tight foreskin (*see* PHIMOSIS). The rupture is usually easily reducible by placing the child on his back and pressing gently on the swelling, at the same time supporting the edges of the muscular opening with the fingers of the other hand. If the protrusion keeps returning, operative treatment must be considered, or a properly fitting truss of the appropriate type must be worn both by day and by night.

RUSSIAN BATH.—*See* BATHS.

ST. VITUS'S DANCE, or chorea (from a Greek word meaning dancing). A disease common in childhood, characterized by spontaneous irregular movements of the limbs or of the whole body, with a tendency to inflammation of the heart and other rheumatic troubles. Girls are more often attacked than boys, and badly nourished children more often than those in better circumstances. The chief exciting causes are fright, shock or emotion. Eyestrain and imitation of choreic movements are of practically no significance. There is a close relationship between chorea and acute rheumatism, and the two often co-exist. Most probably both the endocarditis and the chorea are the result of the circulation in the blood of a toxin which in the majority of cases is rheumatic, but in others is of unknown origin.

Symptoms.—Irregular and purposeless convulsive movements of the limbs, trunk, face and tongue, rendered worse on attempting to execute voluntary acts and delicate movements such as picking up pins, con-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

veying a cup to the mouth, writing, etc. As the child lies in bed the movements may cause the body to be twisted to one side, then suddenly changed to the other. "An extremely exaggerated fidgetiness" sums up the condition. Combined with irregularity there is inco-ordination of movement which shows itself in writing, in unsteady walking and irregular breathing. The muscles become weak, and mental changes such as irritability, inattention, defective memory and dullness may all appear.

The valves of the heart are often damaged as a result of the rheumatic element. The tendency is towards slow recovery, but relapses are common.

Treatment.—Rest in bed is most important. If the patient is very irritable and the movements are violent, the child must be kept in a darkened room and away from disturbing noises. Food must be light but nutritious and include an abundance of milk and cream. Cod-liver oil is useful and the bowels must be opened regularly. A seaside holiday for a prolonged period is very advisable after a severe attack.

SALIVA.—The mixed secretions of the salivary glands (the parotid, submaxillary, sublingual and mucous glands). Its purpose is to moisten and lubricate the food, to dissolve some of the substances in it, to facilitate tasting, to aid in swallowing and articulation, and to begin the digestion of starches.

SALPINGITIS.—Inflammation of the fallopian tube.

SALVARSAN.—An organic compound, containing arsenic, which is a specific remedy for spirochætal diseases, especially syphilis. Discovered by Ehrlich and popularly referred to as "606."

SAL VOLATILE.—Aromatic spirit of ammonia.

SARCOMA.—Name given to a variety of cancer arising from connective tissue (bone, muscle, tendon, etc.), in which the malignant growth is rather more rapid, occurs at an earlier age and is fortunately susceptible to the action of radium and X-rays. A sarcoma often follows injury, whereas carcinoma is likely to follow chronic irritation.

In other respects there is great similarity; secondary deposits are formed by means of portions of the growth being transplanted via the blood or lymphatic streams to the lungs and to the liver, and there start a fresh growth. For cause and treatment generally, *see* CANCER.

SCABIES.—*See* ITCH.

SCALDS.—*See* BURNS AND SCALDS.

SCAR.—The tissue which replaces a localized loss of substance; it is usually red for the first month or so, and then gradually becomes white. If there is an excess of fibrous tissue it is often tender; overgrowth of fibrous tissue may become excessive when a cheloid is formed. This requires treatment with radium or X-rays.

SCARLATINA.—*See* SCARLET FEVER.

SCARLET FEVER.—An acute infectious disease which most commonly attacks children between the ages of two and ten years. Owing to the fact that the mortality used to be high, it was made a notifiable disease and this rule is still extant. Nowadays, however, the mortality is much less owing to the diminished severity of the attacks.

Infection.—The disease is infectious from the beginning of the attack. One of the first signs is a sore throat which usually appears before the rash, and as long as there are any abnormal secretions from the nose or throat, so long will the patient be infectious. Isolation should be determined rather by the condition of the nose and throat than by the peeling of the skin.

Disinfection of articles of clothing and of furniture is of only secondary importance. One attack generally confers a lifelong immunity. Some people have a natural immunity, e.g. may be exposed to infection without developing the disease. These people can be tested by the "Dick test." A filtrate of a culture of the hæmolytic streptococcus, always found in the throat of persons suffering from scarlet fever, is injected into the skin. If no redness appears within six hours, the person is not susceptible. Graduated injections of the filtrate can be made use of to render susceptible persons non-susceptible.

Incubation period.—Usually from two to five days: quarantine period should be at least a week. After this incubation period the patient complains of sore throat, headache, vomiting and fever. The skin is dry and hot, the tongue furred and may be bright red in patches (strawberry tongue). Within twenty-four hours the rash appears in the form of a number of fine red spots which unite and give a bright scarlet blush. It usually begins on the neck, behind the ears and on the upper part of the chest; spreads over the body in a few hours. The face is very flushed, and the part round the mouth is often very pale, leaving a marked circumoral pallor. The cheeks have a faint tinge of peach blossom as if rouged. The rash fades in the same order as it appears and the skin then begins to peel. This usually takes about four weeks, though it may be longer before the palms of the hands and the soles of the feet are clear.

The throat is sore and the glands of the neck are usually inflamed and may turn into abscesses. After two or three days the temperature drops and the pain becomes less.

Some attacks are very mild and are missed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

until the subsequent peeling occurs. In other cases the symptoms are very severe, and there is an exudation on the tonsils and palate leading to a membrane formation similar to that seen in diphtheria. Necrosis of the tissues and blood-poisoning may result.

Complications.—These are the cause of the high mortality.

(*a*) Nephritis or inflammation of the kidney. Usually at the end of the third week, so that it is important to keep the patient in bed for at least three weeks. It may be severe and result in swelling of the ankles (dropsy).

(*b*) Infection of the middle ear, which may lead to perforation of the drum, mastoiditis, meningitis or brain abscess.

(*c*) Inflammation of joints, with possible abscess formation.

(*d*) Inflammation of the heart, as in acute rheumatism.

Treatment.—Isolation of patient and a good nurse. The mouth and throat must be kept clean by rinsing with an antiseptic such as a free chlorine gargle after meals. The high temperature is treated by tepid sponging. The throat is made comfortable by external cold compresses, e.g. a piece of linen or a handkerchief is soaked in cold water and wrapped round the neck. Food must be light; mostly fluid, milk and water, lemon juice and fresh fruit. Later, milk puddings, fish and thin bread and butter. Until the third week, nitrogenous food (meat and eggs) must be avoided for fear of kidney complications. The disease is treated nowadays by means of sulphonamide drugs.

The treatment of nephritis is to rest the kidneys as far as possible by making the skin work. The skin is stimulated by electric baths, hot packs, etc. Fluids must be given in abundance. Painful joints should be treated by wrapping up in cotton wool and giving salicylates as in the case of acute rheumatism.

SCHICK TEST.—Used to indicate susceptibility to diphtheria. A very weak dilution of diphtheria toxin is injected into the skin, and if the person is susceptible there is a reddening and infiltration round, developing within twenty-four hours and reaching its maximum in forty-eight. A negative reaction indicates immunity.

SCHISTOSOMIASIS. — *See* BILHARZIASIS.

SCIATICA is a disease characterized by neuralgic pain along the course of the sciatic nerve. It usually follows exposure to cold and wet and is dependent on inflammation of the nerve. In addition to pain there are numbness and tingling, tenderness along the nerve, and eventually wasting of the muscles. If the attack is severe the patient must remain in bed and the treatment consists in the application of counter-irritation as by acupuncture, the application of plasters, etc. Any septic focus, such as diseased tonsils or septic teeth, should be removed.

SCLERODERMA is a progressive hardening of the skin, either in patches or generally. The skin becomes hard and pigmented and firmly attached to underlying structures. Joints may become immobile from these adhesions of the skin. The only drug known to be of use is thiosinamine.

SCLEROTIC.—*See* EYE.

SCOLIOSIS.—*See* SPINAL CURVATURE, LATERAL.

SCROFULA.—A term applied to a condition in which enlargement of the lymphatic glands and necrosis of the bones occur. It is now considered to be a form of tuberculosis. The term has also been used to cover a constitutional condition which prepares the way for tuberculosis and other diseases. Thus a scrofulous subject offers less resistance than normal to external injuries, so that, for instance, scratches which would normally heal up tend to become septic and form unhealthy sores.

SCROTUM.—The pouch in the male containing the testicles.

SCURFINESS.—*See* DANDRUFF.

SCURVY.—A deficiency disease on a par with rickets, but due to the absence in food of vitamin C. It is liable to occur where fresh food is limited, as on board ship, in polar expeditions, etc. The vitamin is present in plant tissues when active growth is taking place, e.g. it is absent in dry pulses and cereals, but will appear if these are soaked in water and allowed to germinate for a few days. It is ironical to think that in the days of Christopher Columbus scurvy was rife, and yet they carried these dry pulses and cereals as part of the food supply. Lime juice was known to cure and prevent scurvy, but has failed to do so recently. The reason for this is that modern preserved lime juice contains no anti-scorbutic vitamin. Until 1850 lime juice was prepared from Mediterranean lemons; since then West Indian limes have been used. The preserved juice of these is not anti-scorbutic.

Symptoms.—The patient loses energy, the gums are puffy and spongy and liable to bleed, the teeth become loose, the tongue is dirty and constipation is the rule. Hæmorrhages occur from the nose and under the conjunctiva. Bruises are frequent and anæmia is common. It has caused a very high mortality among crews from heart failure and intercurrent diseases.

Treatment.—Fresh food containing the essential vitamin: fresh oranges or lemons are most effective. Milk and brown bread

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(containing the germinal portion of the wheat in the flour) is also useful. The most efficient method is to add adequate quantities of ascorbic acid (pure vitamin C) to the diet.

Scurvy is sometimes present in infants, alone or in combination with rickets. The infant has usually been fed exclusively on a proprietary food and the treatment consists in adding three or four teaspoonfuls of orange juice to the diet every day.

SEA BATHING.—*See* BATHS. A seaweed bath is one in which finely chopped sea-weed has been added.

SEA-SICKNESS.—A condition occurring in persons on board ship and due to the pitching and rolling of the vessel. It is characterized by vertigo, nausea, retching and prostration. It nearly always passes, but in exceptional cases may lead to severe exhaustion and even end in death. No drug will suit everybody equally well. Chloretone, chloral hydrate, aspirin and bromides are all useful. Chloretone should be taken in doses of 5 grains at half-hourly intervals, preferably starting before embarking, until a maximum of 20 grains has been taken. Before a sea voyage the bowels should be regulated, glucose taken and a moderate meal eaten about three hours before going on board.

SEBACEOUS CYSTS.—*See* CYSTS.

SEBORRHŒIC DERMATITIS. — A disease of the sebaceous glands producing excess of secretion which collects upon the skin in the form of an oily coating or of crusts or scales. It is most common on the scalp, but may spread to the eyebrow, moustache and beard and even to the rest of the body. The scales can be removed by an ointment consisting of three parts each of sulphur and salicylic acid to 94 parts of soft paraffin.

SEDATIVES are agents which lessen functional activity.

SEMEN (a seed).—The fecundating fluid of the male.

SEMICIRCULAR CANALS are three canals positioned in the three planes of space and situated next to the hearing apparatus. They are for the proper balancing of the body. There are small calcareous particles (otoliths) inside these canals, and by their movements the brain is informed of the exact position of the head relative to the body and is made aware of any movement.

SENILE PRURITIS.—*See* ITCHING.

SEPTICÆMIA.—An infection caused by the presence in the blood of bacteria and toxins (*see* BLOOD-POISONING).

SERUM TREATMENT.—*See* VACCINE AND SERUM TREATMENT.

SHAKING PALSY, or Paralysis Agitans, is an affection marked by tremor in the muscles involved. It usually begins in one hand and persists during rest. Later in the disease there is a typical gait, which consists in progressive increase in the pace till the patient breaks into a run which becomes faster and faster until he falls or seizes some support. The disease is most common in males over forty and may last from thirty to forty years. The cause is not known. Often the face is expressionless, as if a mask were being worn, a condition known as "Parkinsonism." Parkinsonism will occur in young people who have had sleepy sickness.

Treatment is unsatisfactory: an outdoor life should be aimed at and excitement of all kinds should be avoided.

SHINGLES or Herpes Zoster (girdle) consists of blisters (vesicles) which occur along the skin distribution of a nerve, usually on the trunk and nearly always confined to one side. The outbreak of the eruption is often preceded by severe neuralgic pain along the line of the nerve affected. The pain usually disappears readily in children, but may be very severe and persistent in adults, and has even led to suicide. The commonest nerve of the face to be affected is the ophthalmic branch of the fifth cranial nerve, and this may result in an ulcer on the cornea, or transparent portion of the eye, which requires careful treatment to avoid any subsequent opacity.

It is allied to chicken-pox in that sometimes a case of herpes is followed by a case of chicken-pox and vice versa. It is also held to be a counterpart of infantile paralysis, as in the latter disease the part affected is the motor nerve cell of the spinal cord, whereas in herpes it is the sensory nerve cell of the spinal cord which is affected.

Treatment.—Protection of the vesicles by painting with collodion, or some ointment such as zinc ointment. The vesicles disappear spontaneously after two to three weeks. Morphia may be necessary if the pain is severe, otherwise a sedative such as phenacetin in doses of 5 grains three times a day will be sufficient.

SHOCK.—A condition of grave depression of the system produced by operation, accidents or strong emotion causing a profound influence on the nervous system. The breath becomes rapid and the pulse can hardly be felt; the face and the extremities are cold, the forehead covered with sweat.

Treatment consists in applying warmth to the patient in the form of hot bottles, hot drinks, etc. Bed if practicable; the foot of this should be raised so as to keep as much as possible of the blood circulating in the cerebral area. Artificial respiration may be necessary. Alcohol may be given provided the condition is not due to loss of blood as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the stimulant might restart a hæmorrhage.

SHORTNESS OF BREATH. — *See* BREATHING, DIFFICULTY OF.

SIDE ACHE, or pleurodynia, is a sharp pain in the intercostal muscles of rheumatic origin. (*See* RHEUMATISM (MUSCULAR).

SIGHT, DEFECTS OF.—The common defects of sight are:

(*a*) Long sight.
(*b*) Short sight.
(*c*) Old sight.
(*d*) Astigmatism.

Long sight or hypermetropia; to understand this affection it is essential to understand that in the normal eye parallel light, or light coming from a distance, is normally focused on the retina when the eye is at rest. When the eye is looking at a close object, muscles pull on the ligaments supporting the lens which focuses the rays of light, so that it tends to become more globular and therefore has a shorter focal length. Rays from a close object diverge as they approach the lens, but the fact that the lens has now a shorter focal length enables it still to focus the object on the retina.

In the case of long sight the eyeball is too short, so that rays from a distant object are focused at a point behind the retina, or would be if the ciliary muscles did not contract and so allow the lens to become more globular. As the amount of contraction is limited, it follows that the point of nearest vision is farther away than in the normal (or emmetropic) eye. Any muscle kept constantly contracted becomes strained, and the ciliary muscle is no exception. The defect of a short eyeball is overcome by placing a convex lens in front of the lens of the eye, and the combined effect of the two lenses is to focus rays from a distant object on to the retina while the ciliary muscle is at rest.

In short-sightedness (myopia), the eyeball is too long and the rays of light from a distant object would naturally come to a focus in front of the retina. Nothing that the eye can do will overcome this difficulty. The remedy is a suitable concave lens in front of the lens of the eye of such a strength that the rays are focused on to the retina.

Old sight or presbyopia: in this case the trouble lies in the lens of the eye in that it loses its elasticity, so that when the muscles which enable it to become globular are contracted, the lens does not alter sufficiently in shape. This means that close objects cannot be properly focused, and a convex lens must be placed in front of the eye for close work such as reading. Distant vision is unaffected. This loss of elasticity of the lens is normal in people over forty years of age.

Astigmatism is a term used to cover irregularities of the surface of the cornea. Normally the cornea should be spherical, but sometimes the radius of curvature in one plane differs from that in another, and this means that objects in different planes cannot be focused at the same time. The strain produced by the constant efforts of the ciliary muscles to effect a compromise and achieve the impossible is a very potent cause of eyestrain and headaches. By means of lenses, the focal lengths of which correspond inversely to the radii of curvature of the cornea, correction can be made.

Lenses as above should always be prescribed by an oculist as he will also examine the eye and make sure that there are no other troubles present. For other affections of the eye *see* AMBLYOPIA; BLINDNESS; CATARACT; COLOUR-BLINDNESS; CONJUNCTIVITIS; EYESTRAIN; GLAUCOMA; MINER'S NYSTAGMUS; OPHTHALMIA.

SILICOSIS is a chronic fibroid condition of the lungs or bronchial lymphatic glands, produced by the inhalation of particles of silica dust, e.g. dust from flints, granite, etc. This disease is now notifiable and may render the sufferer liable to compensation under the Workmen's Compensation (Silicosis) Act, 1918.

SKIN.—The protective covering of the body; it consists of two main divisions:

Epidermis, which consists of several strata or layers, and is generally thin except in the palms of the hands and in the soles of the feet. It also becomes thickened elsewhere in the form of corns and callouses where it is subjected to intermittent pressure. Pigment cells are also present in the deepest parts of the epidermis. These are least numerous in the case of the white-man and most numerous in the black man. The epidermis does not contain blood-vessels or nerves and therefore an injury to it does not cause pain.

Dermis, or true skin, is richly supplied with blood-vessels and nerves. It contains the sweat glands, through which moisture and heat are dissipated. Hair follicles are found everywhere except in the palms of the hands and in the soles of the feet. Small muscles are attached to the shafts of the hairs and by their contraction they cause "goose-skin." These muscles are not under voluntary control, but are innervated by the sympathetic system which is influenced by the emotions, such as fright and anger. On the inner walls of the hair follicles are the orifices of sebaceous glands, which secrete an oily fluid required by the skin for lubrication. The functions of the skin are:

(*a*) Protection of the body against injury by its toughness and elasticity.
(*b*) Regulation of temperature.
(*c*) Exclusion of bacteria.
(*d*) Excretion of waste substances.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SKIN, TUBERCULOSIS OF. — *See* LUPUS VULGARIS; SCROFULA.

SLEEP, DISTURBED.—For inability to sleep, *see* INSOMNIA.

Disturbed sleep in a child is usually a sign of some gastric disturbance or of an approaching illness, provided there are no obvious reasons for the restlessness, such as insufficient warmth or an uncomfortable position. Difficulty in breathing due to obstruction of the respiratory passages will also cause disturbed sleep; this applies especially to enlarged tonsils and the presence of adenoids. Sedatives should never be prescribed except by a doctor. Often a warm bath before bed will ensure a restful night and enable the child to have a refreshing sleep. (*Also see* NIGHT TERRORS.)

SLEEPING SICKNESS. — *See* TRYPANOSOMIASIS.

SLEEPY SICKNESS.—*See* ENCEPHALITIS LETHARGICA.

SLEEPWALKING, or somnambulism, is a condition in which the senses are all partially suspended, or it may be a type of hypnotic sleep in which the subject is possessed of all his senses, often having the appearance of one awake, but whose will and consciousness are under the control of the hypnotizer.

Somnambulism must be taken as an indication of some nervous instability, and requires treatment. The exciting cause may be either physical, in the form of unsuitable food, or mental, as grief, fright, mental exhaustion, etc. The idea that a sleepwalker is safe in perilous positions is not correct, and precautions against this should be taken.

Treatment.—A sleepwalker should not be wakened up suddenly, but he should be either addressed quietly and authoritatively or led back to bed. If the habit becomes established he should be awakened after the first hour's sleep, as the trouble usually occurs during the deep sleep. The bedroom should be well ventilated and the bedclothes not too warm. A sedative before retiring is useful.

SLUGGISH LIVER. — *See* BILIOUSNESS; TROPICAL LIVER.

SMALLPOX, or Variola, is an infectious disease the cause of which is unknown. The infection is spread by the breath of the patient, by contact with the contents of the pustules, scabs, and even by the skin. The virus will also linger in infected areas such as clothing and is even given off from the dead. Air-borne infection is also a possibility.

About twelve days after the infection the disease begins with an attack of shivering, a headache, pains in the back and vomiting. In children there may be convulsions. The temperature rises rapidly and there may be a rash. On the third day the fever usually declines a little and the rash proper begins. The spots are most numerous on the face and head and on the distal portions of the extremities; this is in marked contrast with chicken-pox, where the rash is most marked on the trunk and least on the legs and arms. Differential diagnosis may depend on this.

Three days later the papules become vesicles which are at first clear; later they become turbid in the middle. In two more days the pustules become filled with pus and are surrounded by an inflammatory ring. A secondary fever is now induced by absorption of all this septic matter. Later the pustule begins to dry and a scab forms which drops off, leaving a depressed scar.

Alastrim is the name given to an extremely mild form of smallpox and is commonly recognized as being related by the fact that vaccination will protect against both smallpox and against alastrim during epidemics. There are also very severe types of smallpox: the confluent type, in which the pocks run together; and an even more severe type known as the hæmorrhagic, in which the pocks are filled with blood. This type is nearly always fatal.

Treatment.—Isolation in a special hospital is imperative. There is no specific treatment.

General Hygiene.—Bed; fresh air; plenty of fluid, and milk diet. The mouth should be kept clean by a suitable gargle. (*See* SCARLET FEVER.)

During the eruption the hair should be cut short. Relieve itching by cold water or 2-per-cent carbolic. Smear the body and face with petroleum jelly. Continuous warm baths are very valuable, as they hasten the separation of the crusts. Inflammation of the windpipe must be watched for carefully in case tracheotomy is necessary to prevent suffocation. The nurses must be protected by having recently been vaccinated or by having had an attack of smallpox.

Prevention.—Vaccination within a few years is an absolute prevention of smallpox, and it may even prevent an attack if successfully performed within a day or two of exposure.

SMELL, PERVERSION OF.—Usually due to functional disorders of the nervous system. There is no treatment. It tends to disappear spontaneously and these perversions are usually of short duration.

SMOKING.—The using of tobacco. Excessive smoking is an exciting cause of cancer, gastric disturbances, sore throat, and may also give rise to a patch of chronic inflammation on the mucous membrane of the mouth if a pipe is held in one position for a long period of time.

SNAKE BITES.—The only poisonous snake likely to be found in Great Britain is the adder or viper. The wound becomes

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

red, swollen and painful, and the patient may collapse. Death is rare.

Treatment consists in tying a tight band round the limb between the bite and the heart to prevent the poison from being disseminated, and then cauterizing the wound with strong permanganate solution or wiping it with permanganate crystals. A stimulant such as brandy should be given to counteract shock.

SNOW BLINDNESS.—*See* BLINDNESS.

SOFT CORNS.—*See* CORNS.

SOFT SORE, or soft chancre, is due to Ducrey's bacillus. It is one of the venereal diseases and is so called to distinguish it from the early stage of syphilis, which produces an indurated sore known as a "hard chancre." It is caught by sexual intercourse with an infected person. The sores appear from within a few hours to a few days. They are always on or near the immediate neighbourhood of the sexual organs. The nearest lymph glands become painful and may turn into abscesses.

Treatment is by suitable ointments, as those containing carbolic acid, iodoform, etc., and the taking of hot baths. Scrupulous care must be taken not to infect the skin around. A cure is usually effected in three weeks. The condition never becomes constitutional in the same way that syphilis does, though the two conditions may co-exist.

SOMNAMBULISM. — *See* SLEEP-WALKING.

SORE NIPPLES.—*See* SUCKLING.

SOUR MILK.—(Yoghurt is the name given to Bulgarian sour milk.) Milk artificially soured by the introduction of lactic acid bacilli. The practice was originated by Metchnikoff with the idea that, as the lactic acid bacillus was normal in the human intestine, and as its presence is inimical to the growth of other and harmful bacteria, an excess of these lactic acid bacilli would prevent any of the troubles due to auto-intoxication. He even believed that it would have the effect of prolonging life.

SPASM.—A sudden muscular contraction. (*See* CRAMP.)

SPEECH DISTURBANCES. — *See* APHASIA; APHONIA; STAMMERING.

SPERMATOZOA.—The male elements capable of fertilizing the ovum.

SPERMATORRHŒA is the involuntary discharge of semen without sexual excitement. People who live a continent life are liable to become worried and depressed over these nocturnal losses, and may even become neurasthenic. The condition is normal if the losses are not too frequent, otherwise a physician must be visited to determine the cause, which may be:

(*a*) local, such as constipation, irritation of the sexual organs by walking or riding, varicose veins, too long foreskin, intestinal worms, etc.;

(*b*) general, such as the reading of exciting and pornographic literature before retiring to bed.

Treatment consists in removing the cause as outlined above. Cold hip baths, suitable exercises and often a change of surroundings and of companions will help considerably. A sedative mixture consisting of bromide (10 grains of potassium bromide, a teaspoonful of syrup of orange in half an ounce of water at night) will often give a night free from symptoms.

SPHAGNUM MOSS consists of the stumps and leaves of various bog mosses which are cleaned and dried. It is highly absorbent and deodorant and was formerly used for fæcal and urinary discharges or in pads as a substitute for cotton wool.

SPINA BIFIDA.—A protrusion of the spinal membranes through a congenital opening in the lower part of the vertebral column. This protrusion becomes tense when the child dies. The malformation is serious as a rule; if slight in degree spontaneous recovery may occur, otherwise surgical interference is necessary

SPINAL ANALGESIA is the name given to the anæsthesia produced when a suitable drug such as novocain or stovain is injected into the space surrounding the spinal cord. The portion of the cord under the action of the drug is completely paralysed for a few hours and is incapable of conducting any sensory or motor impulses, with the result that complete relaxation is obtained for the surgeon and no pain is felt by the patient. It is usually applied to the lower part of the spinal cord only for operation on the lower part of the abdomen and legs. Higher anæsthesia is more dangerous, as respiratory failure may result.

SPINAL CARIES.—*See* SPINAL CURVATURE, ANGULAR.

SPINAL COLUMN. — The vertebral column, composed of vertebræ, intervertebral cartilages and ligaments.

SPINAL CORD.—The structure of nervous tissue which extends downwards as a continuation of the brain and occupies the vertebral canal. Biologically, it is the oldest, most primitive part of the nervous system.

SPINAL CURVATURE, ANGULAR.—(Pott's disease, kyphosis and spinal caries.) This produces the well-known condition of humpback and is nearly always due to tuberculous disease of the bodies of some of the vertebræ. It can be recognized in the early stages by the fact that the child affected becomes tired very easily, and that the movements of the spine have become markedly restricted.

On being requested to bend down it is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

found that the spine tends to move as a whole owing to the rigidity of the muscles round the diseased portion. Further investigation will also reveal tenderness over the part affected. Confirmation of the condition will be obtained if an X-ray photograph is taken.

If untreated definite malformation will result and an abscess may be formed which makes its way to the surface in the loin or elsewhere. There may be pressure and even damage to the spinal cord resulting in difficulty in walking and in the formation of bedsores, with lack of control over the bowel and bladder. The process may become arrested at any time, but the bone destroyed is not replaced.

Treatment.—Absolute rest for months—up to two years—with the spine placed in a suitable position so that when healing has occurred there is no deformity. The patient is usually made to lie on his back in a bed made of plaster of paris moulded to him so that it fits him perfectly. General sanatorium treatment including fresh air, good food, real or artificial sunshine, are all necessary. Tuberculin injections help in selected cases. The contents of an abscess must be removed by aspiration.

An operation in which a bone graft is placed through the spines of the affected vertebræ to give them complete immobilization will often shorten the period of treatment.

SPINAL CURVATURE, LATERAL, or scoliosis, is a twisting of the spinal column without disease of the bony structure. It is usually found in rather weak children who do not take much exercise. It may be attributed to sitting in awkward positions, the carrying of heavy weights over one arm, etc. The twisting of the spine produces corresponding changes in the appearance of the chest wall and a bulging of the ribs near the breast bone. Often this bulging is mistaken for a pathological swelling without the primary cause, e.g. the twisting of the spine, being recognized.

Treatment is preventive by avoiding the postural attitudes which are liable to lead to the deformity. Remedial exercises are essential and should consist more of skipping and trapeze work than an exercise such as walking. Breathing exercises tend to strengthen the chest. Plenty of open air and good food are also required.

SPINAL NERVES. — *See* NERVOUS SYSTEM.

SPIROCHÆTES.—A type of bacteria characterized by flexible spiral filaments.

SPLEEN, ENLARGED.—Enlargement of the spleen, known as splenomegaly, is a feature of a number of infectious and blood diseases. Operation is indicated in some cases, according to the specific cause.

SPLENOMEGALY.—*See* SPLEEN, ENLARGED.

SPLINTS.—Term applied to wood, metal or other material used for keeping the ends of a fractured bone at rest. In rendering first aid, splints extending beyond the joints above and below the fracture must be applied before the patient is moved. For a broken leg a walking stick, scout pole, billiard cue, etc., may be used. In the case of a broken arm it is best to splint the arm to the body with the elbow half flexed by means of strips of clothing or a scarf wrapped round both the arm and the body. Where a splint passes over a body-prominence, padding such as cotton wool should be placed between the prominence and the splint.

SPONDYLITIS DEFORMANS is a chronic inflammation of the vertebræ terminating in fixation and deformity. (*See* ARTHRITIS.)

SPONGIOPILIN. — Felted or woven cloth into which tufts of sponge are incorporated and one side is coated with rubber. Formerly used as a poultice. (*See* FOMENTATIONS.)

SPONGY GUMS. — *See* BREATH, OFFENSIVE.

SPORADIC DISEASE. — Disease occurring in isolated cases.

SPOTS BEFORE THE EYES.—*See* EYES, SPOTS BEFORE.

SPOTTED FEVER. — *See* CEREBRO-SPINAL FEVER.

SPRAINS AND STRAINS.—A sprain is a wrenching of a joint, producing a stretching or laceration of the ligaments. A strain is the wrenching of muscles or of tendons (leaders).

Sprains.—One or more of the ligaments of a joint are torn so that there is bleeding and weakness of the joint. The blood is usually readily visible under the skin as a bruise. The lining membrane of the joint becomes inflamed and pours out synovial fluid so that the joint swells and becomes stiff and painful to move. If possible a firm bandage should be applied immediately so as to prevent the effusion of fluid and excessive bleeding. It is the absorption of blood from the tissues which makes the cure of a sprain such a lengthy business. Immobilization of the joint affected, coupled with massage of the parts immediately surrounding so as to keep the blood circulating at its best, is indicated. A suitable support, such as adhesive strapping, must be used in early attempts at movement of the affected joint. The joint most commonly sprained is the ankle; immediate treatment consists in leaving the shoe on and applying a strap or belt or a couple of handkerchiefs knotted together below the waist of the shoe; the ends are crossed over the instep and carried

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

round the ankle and the lower part of the leg and secured firmly. Sir James Cantlie, in the First Aid Manual of the British Red Cross Society, points out how the patient can be assisted home if no conveyance is available: "Supposing it is the left ankle that is sprained, the helper stands on the left side of the patient (that is, on the same side as the injury), brings the patient's left arm over his (the helper's) left shoulder, tucking his right shoulder beneath the patient's left axilla. The helper now grasps the patient's left wrist with his (the helper's) left hand and passes his right arm round the patient's waist so that the hand appears well forward on the patient's right side on a level with the haunch-bone. In this position, if the patient raises his left foot from the ground he can, with the assistance of the helper, hop along on the right foot quite quickly, even at a running pace. The helper, by bringing the patient's weight on his right side, can carry the patient over obstacles, or a considerable distance if the patient is faint."

Strain: when referring to injury means the stretching or tearing of a muscle or tendon. Immobilization of the injured part by suitable splinting may be necessary, and the pain may be relieved by fomentations. If the back is involved, rest in bed is often necessary. Massage, hot douches, electrical treatment, etc., are all useful.

SPRUE.—A chronic catarrhal inflammation of the entire alimentary tract, especially prevalent in Malaya, also called Ceylon sore mouth, diarrhœa alba. No definite cause is known.

Treatment consists chiefly in a diet of milk and strawberries.

SQUINT or STRABISMUS.—An abnormality of the eyes in which the visual axes do not meet at the desired point, as a result of inco-ordinate action of the external ocular muscles.

Squint usually occurs in children after the age of five years, and is often due to the fact that the image in one eye is not clearly defined; this may be due to long or short sight or to some corneal opacity. When the defective eye does not at first correspond with the good eye, a double image is produced. The child soon learns to ignore the imperfect image and the unused eye will in time lose the power of sight through disuse.

The remedy is to make the defective eye function normally by wearing suitable glasses and by covering up the other eye for a short time. A squint may be due to irritation which has been set up by unsuitable food or by worms, etc. Such cases improve when the cause is removed. If neglected for a long time, operation on the ocular muscles will be necessary.

STAMMERING often occurs in nervous individuals and is not uncommon in children belonging to families where there is some nervous trouble. In many cases it is due to unconscious mimicry, but as a rule there is some predisposition as well. The labials "p" and "b" present the most difficulty.

The sufferer must be taught to have confidence in himself. Rapid speech must be discouraged and he must be taught to speak slowly and deliberately. Elocution and singing lessons should be taken, as stammerers can sing and recite without difficulty. General health must be kept at as high a level as possible, as the sufferer will stammer worse if run down.

STAPHYLOCOCCI.—Name given to a genus of bacteria in which their small round bodies are clustered together like a bunch of grapes.

STATUS LYMPHATICUS. — A condition in which all the lymphatic tissues, the thymus, the spleen and the bone marrow are markedly hyperplastic or overgrown. Sudden death is likely to occur from shock, especially through surgical anæsthesia. The cause of the hyperplasia or overgrowth is unknown and is practically impossible to detect during life, though readily discernible when a post-mortem examination is performed. The enlarged thymus may cause pressure on the trachea, but asphyxia due to this is rarely the cause of death.

STERILITY is a term applied to failure to conceive after four years of marriage during which no contraceptive measures have been taken. It may be due to development defects in either husband or wife, or as a result of disease.

Potency of the fallopian tubes can be demonstrated by means of an X-ray picture when the uterus is inflated with air or oxygen under slight pressure. Motile spermatozoa can be demonstrated in the male by immediately examining the products of emission under the microscope in normal saline solution which is at body temperature.

STERILIZATION OF MILK. — *See* Pasteurization.

STIFFNECK.—*See* Wry-Neck.

STIMULANTS are agents which increase functional activity. Alcohol in small doses is a stimulant, but in larger quantities it depresses the higher centres. Camphor in oil and a solution of a strychnine salt injected hypodermically are examples of cardiac stimulants. Ammonia is largely used as a general stimulant in the form of sal volatile. It causes nausea and vomiting, so that it seldom leads to the formation of a habit. Digestive stimulants include salt, pepper, mustard, pickles and cheese.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

STITCH IN THE SIDE. — *See* PLEURISY; SIDE ACHE.

STOMACH.—The dilated portion of the alimentary canal at the end of the food pipe. It acts as a reservoir for food, sterilizes it by virtue of the free hydrochloric acid it contains and also continues the process of digestion initiated by the saliva.

STOMACH, DILATATION OF. — Stretching of the walls of the stomach to such an extent that they cannot return to their normal size when the cause of the distension is removed.

Acute dilatation usually occurs during general anæsthesia or after an operation, such as those on the kidney or gall-bladder The symptoms are sudden in their onset; the vomiting of enormous quantities of fluid and finally collapse. Mortality is about 75 per cent.

Treatment is to empty the stomach with the stomach tube. Turn the patient over on to his stomach. Give stimulants.

Chronic dilatation is due to poor health, constant over-filling with food and drink, or chronic catarrh. It may be due to obstruction farther down the alimentary canal.

Symptoms.—Gastric disturbances; the appetite is deficient or normal. There is marked flatulence. Vomiting is uncommon.

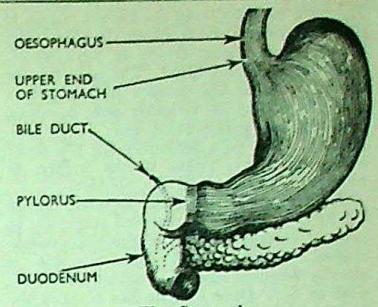
Treatment. — The stomach should be washed out daily at first, this being gradually reduced to once a week. Abdominal exercises, attention to bowel movement, readily digestible meals without fluid are all useful. The Weir-Mitchell treatment should be instituted if the neurotic element is marked.

Of course, if the dilatation of the stomach is due to obstruction elsewhere, operation for the relief of the obstruction is indicated.

STOMACH, ULCERS OF. — These usually occur between the ages of twenty and thirty years. The cause is entirely unknown. The ulcer starts in the mucous membrane and may heal up, or it may extend through the other walls until it eats through a blood-vessel, causing a hæmorrhage, or through the peritoneal coat, when a perforation results. Perforation is an urgent condition with intense pain and extreme collapse, due to the peritonitis caused by the stomach contents entering the peritoneal cavity. Only an immediate surgical operation can save the patient.

It is possible that dental sepsis is a cause of ulcers of the stomach, and they have been known to follow severe burns involving much loss of skin.

Symptoms. — Pain over the stomach definitely related to food, usually one to two hours after a meal. Vomiting usually occurs when the pain is severe, and gives relief. Hæmatemesis, or the vomiting of blood from the stomach, is fairly frequent. Occult blood, e.g. the presence of blood in the motions when tested for by a pathologist, is a fairly constant symptom.



The Stomach

The pain is often intermittent, and there may be prolonged intervals in the case of a chronic ulcer without any pain.

Treatment.—The medical method consists of absolute rest in bed for several weeks, resting the stomach as much as possible and giving an alkaline powder. Equal parts of bismuth oxycarbonate, magnesium carbonate and sodium bicarbonate are given in doses of a teaspoonful half an hour after each meal and two at bedtime.

Diet:

1st week—milk, 3 pints daily.
2nd week—add two to three eggs, then toast, butter, cream and tea.
3rd week—eggs, cream, tea and butter. Milk puddings and lightly steamed fish.
4th-6th weeks—gradual return to light diet.

Progress under medical treatment should be watched by a series of X-ray pictures. Operation will be necessary if the above measures fail.

STONE IN THE KIDNEY.—The cause of stone formation is not definitely known. As a rule one stone over a quarter of an inch in diameter is found in the pelvis of the kidney. There may be more than one. The chief factors of importance in the formation of calculi are high acidity and high concentration of solids in the urine. The stone usually consists of oxalate or phosphate of calcium.

The kidney may be so damaged by back pressure set up by the stone that most, or perhaps even all, of the kidney substance is destroyed.

Symptoms.—Usually no pain while the stone is in the kidney, but the moment it begins to pass down the ureter it causes intense pain known as renal colic. This has an onset of acute and agonizing pain often beginning after exertion or a sudden jolt.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The pain radiates from the kidney region to the inner side of the thigh on the same side. There is an urgent desire to pass water, which may contain blood. The pain may be so intense that the patient rolls about in agony and may be violently sick, breaking into profuse perspiration and finally collapsing. The pain continues till the stone ceases to move, either in the ureter, or because it has reached the bladder.

Treatment.—If the stone is a big one in the kidney, it must be removed surgically to prevent further damage of the kidney substance. During renal colic morphia is usually required and the patient should be kept in bed. Once a stone has reached the bladder it may be passed naturally.

Preventive Measures. — If the urine always contains a high proportion of solids, the diet must be regulated to prevent this, e.g. by avoiding rich meats such as sweetbreads, and by avoiding rhubarb, spinach, strawberries, tomatoes, etc., which contain oxalates. Spa treatment, as carried out at Contrexeville, may effect a cure.

STRABISMUS.—*See* SQUINT.

STRAINS.—*See* SPRAINS AND STRAINS.

STRAWBERRY TONGUE. — This is the characteristic tongue of scarlet fever. The vessels of the papillæ become turgid, causing contrast with the thick coating of fur on the rest of the tongue.

STREPTOCOCCI.—A type of germ in which the bacteria are arranged in strings.

STRICTURE OF URETHRA. — *See* URETHRA, STRICTURE OF.

STRIDOR.—A peculiar harsh sound produced during expiration.

STROKE.—*See* APOPLEXY.

STRYCHNINE POISONING.—Strychnine is the chief alkaloid of nux vomica. It is the basis of many vermin killers. It acts as a poison by allowing any stimulus to produce a violent contraction of all the muscles of the body, with the result that the patient is unable to breathe, becomes asphyxiated and relaxes till he recovers consciousness, when any stimulus will start off a fresh contraction. During the contraction the muscles round the mouth pull it into a peculiar sort of smile known as the risus sardonicus. The extensor muscles of the body are more powerful than the flexor, so that the patient rests on his head and on his heels—opisthotonos. The abdominal muscles are as hard as a board, the chest is fixed, the face becomes livid and the eyeballs are staring.

Treatment.—Administer chloroform or ether. Wash out the stomach with a solution of permanganate of potash. Give large doses of chloral hydrate or bromide into the bowel. Apply artificial respiration if necessary. Rectal injections of the drug known as avertin are also recommended.

STUPE.—A cloth used for applying heat or counter-irritation, especially a cloth wrung out in hot water and sprinkled with turpentine.

STUPOR.—A condition of being partly conscious or sensible.

STUTTERING.—*See* STAMMERING.

STY.—The inflammation of a small gland near the root of an eyelash. The part becomes inflamed and forms a small abscess which soon bursts if bathed with hot water. If sties recur rapidly, the general health must be treated by means of tonics and the diet regulated to consist of easily digested food together with the addition of cod-liver oil. The eyes should also be tested.

SUCKLING.—To avoid deficiency in milk supply, the meals should be regular and nourishing, with plenty of fluid; excess of milk should be avoided as it is liable to upset the digestion of the other food. The baby should be put on the breast at regular intervals and to each breast alternately, as the more powerfully he sucks the more will the breast respond and produce the necessary milk.

Over-secretion.—There may be so much that the excess discharges into the clothes; here the fluid intake should be reduced. To prevent the child from drinking too hurriedly the nipple should be squeezed between two fingers while the child is at the breast.

Cracked Nipples are generally due to the fact that dried milk has been allowed to accumulate in the folds of the nipple and make it sore. They can be prevented by carefully washing the nipples after each feed, and by treatment with hot and cold water for two months before pregnancy and rubbing gently with a stiff brush to harden them.

Abscess of the Breast may result from infection in a crack of the nipple. Early signs are those of a tender mass in the breast substance, and at this stage hot fomentations or the application of dressings soaked in a saturated solution of Epsom salts may prevent suppuration. The infant must be placed regularly at the breast to prevent the accumulation of milk. If an abscess forms it is better that it be opened surgically than left to burst naturally, as a surgically opened abscess will result in a smaller scar and will shorten the patient's sufferings. (*See* BREAST.)

SUFFOCATION.—*See* ARTIFICIAL RESPIRATION; FOREIGN BODIES IN THE LARYNX AND WINDPIPE, *under* FOREIGN BODIES.

SUGGESTION.—An artificial production of a psychological state in which the individual experiences such sensations as are suggested to him or ceases to experience those which he is instructed not to feel.

SULPHAPYRIDINE. — Better known

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as M and B 963, this is a drug of much importance as it has been used with great effect in the treatment of pneumonia.

SULPHONAL. — A crystallized substance soluble in water, used as a sleeping draught in insomnia from functional causes.

SULPHURIC ACID is also known as oil of vitriol. It is usually taken as a poison with suicidal intent or may be mistaken for olive oil. No emetic must be given but the acid must be neutralized with alkali, washing-soda, chalk—from the wall or ceiling if necessary—which is broken up in water and given in teaspoonful doses.

Milk and gruel can also be given. General treatment should be given for shock.

SUMMER DIARRHŒA. — *See* Epidemic Diarrhœa.

SUNSTROKE.—*See* Heatstroke and Sunstroke.

SUPERFLUOUS HAIRS.—*See* Hairiness.

SUPPOSITORIES. — Solid medicated compounds designed to be introduced into the rectum. They are usually about an inch in length and about a quarter of an inch at the base. The drugs required are placed in a basis of cacao butter, as this melts just below the body temperature. Suppositories can be used for their astringent, sedative or aperient effects. A useful suppository consists of a small piece of soap.

SUPPURATION.—Formation of pus.

SUPPURATIVE MENINGITIS.—*See* Meningitis, Suppurative.

SUPRARENAL GLANDS. — Small ductless glands which are situated one on the upper portion of each kidney.

SWALLOWING, DIFFICULTY OF.—*See* Œsophagus, Stricture of.

SWEAT, OFFENSIVE (Bromidrosis), may be the symptom of a serious disease, such as rheumatic fever. It often occurs idiopathically and may be general, but is often confined to the armpits or feet. It may occur in people who are of cleanly habits, though lack of personal hygiene is a contributory cause. The parts affected should be shaved and powdered with boric acid.

SYCOSIS, COCCOGENIS.—*See* Barber's Itch.

SYNCOPE.—Partial or complete temporary suspension of the functions of respiration and circulation from cerebral anæmia.

SYNOVITIS. — Inflammation of the synovial membrane which lines the joints of the body. Acute; due to injury or to germs and their presence, e.g. acute rheumatism, gonorrhœa, tuberculosis and blood-poisoning. The joint becomes hot and painful and swollen from the excess of fluid poured out by the acutely inflamed membrane. If the inflammation continues, pus may form in the joint and this may lead to permanent disability of the joint.

Treatment.—Rest is essential and should be ensured by means of splints.

SYNOVITIS, CHRONIC. — This is usually a sequel to the acute form and there is swelling over the joints due here more to the thickening of the surrounding tissues. The joint should be splinted, tied and supported by means of adhesive strapping on the skin. Electrical treatment and massage are also useful.

SYPHILIS.—One of the most serious of the venereal diseases. Introduced into Europe by the crews who sailed to the West Indies with Christopher Columbus. The germ is one of the spirochætes and finds its way into the human system through a breach of continuity of skin or mucous membrane which may be unnoticed by the individual. The infection is usually contracted by contact with secretion from syphilitic lesions, especially a chancre, and early secondary manifestations and usually by sexual intercourse. It may be acquired by kissing, by wet nurses who suckle syphilitic infants, etc.

Symptoms, first stage.—For about three to six weeks after the entry of the germ there is no sign (incubation period), then a sore appears where the primary infection occurred; this is called a "hard chancre." the glands of the groin are also inflamed and become hard.

Second stage.—The primary sore will gradually disappear, even without treatment, but before this the whole system is invaded by the spirochætes, and a few weeks later the rash may occur which may imitate any known skin disease. Ulcers may form on the mucous membrane, and bones, joints, nervous system, arteries and the eye may be the seat of painful inflammatory changes. It is possible for this stage to last about two years but there is no definite time limit.

Third stage.—Usually begins after third year of infection and is a slow and chronic inflammatory process involving the formation of swellings, known as gummata, on the skin and mucous membrane, the nerves and other organs of the body. Those on the surface will break down and form ulcers; those internal destroy the tissues of the organs they attack. Changes in the nervous system may result in tabes dorsalis or locomotor ataxia, or general paralysis of the insane. Syphilis can also be transferred to the child from an infected mother before the child is born, via the placenta. Often the child is born apparently normal and about six weeks after birth the child has apparently a bad chill, "snuffles," the skin becomes wrinkled as in an old man, a rash appears on the skin and death usually

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

occurs sooner or later unless treated. Treatment of a known syphilitic mother right from the beginning of pregnancy will result in a normal and healthy infant.

Treatment. — Preparations of arsenic and bismuth and, more recently, penicillin, are used for the treatment of this disease. Prolonged treatment and medical supervision, with periodical blood tests, are essential.

SYSTEMIC CIRCULATION. — *See* CIRCULATION OF THE BLOOD.

TABES DORSALIS.—*See* LOCOMOTOR ATAXY.

TABES MESENTERICA. — Consumption of the bowels.

TALIPES.—*See* CLUB-FOOT.

TAPEWORMS.—A group of worms parasitic in man and the lower animals. (*See* WORMS.)

TARTAR EMETIC POISONING.—*See* ANTIMONY POISONING.

TASTE, PERVERSIONS OF — In cases of nervous disorder, disagreeable sensations of taste may be imagined, but these signs usually disappear as soon as the nervous system returns to normal.

T-BANDAGE.—*See* BANDAGES.

TEARS, OVERFLOW OF. — *See* EPIPHORA.

TEETH, CARE OF.—It is a generally accepted fact that many affections of the body would be avoided if better care were taken of the teeth. We know that we cannot exclude microbes from the mouth absolutely, no matter how healthy the person, as microbes are present in the air, and the mouth, with its warmth and its moisture, is a very vulnerable spot. It is, of course, just as equally impossible to exclude fermentable carbohydrates from the food we eat. One of the most important points in the care of the teeth is to prevent fermentation, for the acid formed in the process will bring about the first stage of decay. In short, particles of food must never be allowed to remain for any length of time in the teeth. The quality of the food we eat is also of importance, and this factor should be recognized from early childhood right through life. The consumption of sugar in the form of sweets usually produces very disastrous results. Proper mastication of all foods should be carried out in order to develop the bones of the side of the face; this in turn will induce the teeth to grow in a more regular position in the head. The teeth should be brushed at least twice a day, night and morning. A good stiff brush should be used, not hard enough to damage the gums but hard enough to get properly into the spaces between the teeth. There are many varieties of toothpastes and powders to be had, and most of them have antiseptics incorporated in them. The motion of using the brush should be rotary and not merely up and down or across. The use of dental floss should be encouraged as this removes all particles of food left by the toothbrush.

TEETH, DECAY OF.—The decay of the teeth, known technically as dental caries, is due to the action of ferments and to microbes. The decay always starts from the outside of the tooth and is preceded by destruction of the enamel. The particles of food which are allowed to remain between the teeth undergo chemical changes. In this way enough acid is formed to eat through the enamel, thus making an opening for the microbes to enter and destroy the tooth. In the majority of cases the early process is not accompanied by any pain, but if the tooth is neglected the consequences become more serious. The decay proceeds until the sensitive pulp of the tooth is reached, thus opening up a direct connection with the blood-stream. Inflammation may be present, and the pain which is set up may be so severe as to send the sufferer to seek relief in treatment or extraction. Pain may be relieved by placing bicarbonate of soda or a clove into the cavity, but in cases where the decay has advanced no time should be lost in paying a visit to the dentist.

TEETHING AND ITS TROUBLES.—The first set of teeth, the temporary or milk teeth, are twenty in number, ten above and ten below. They usually make their appearance between the ages of six months and three years. They are smaller in size than the permanent teeth and their walls are much thinner. The lower central incisors usually begin to show about seven months after birth and take about one to ten weeks to come through. Upper central incisors start at about nine months and take four to six weeks. Upper and lower lateral incisors start at about twelve months and take four to six weeks. First molars start showing at about fourteen months and take about one to two months. Canines start at about eighteen months and take from two to three months. Second molars start at about twenty-six months after birth and take three to five months to develop. These times vary so much that they can be looked upon only as approximations.

In the case of perfectly healthy children, the teething period should not cause any serious disturbance of health. Much depends on the proper feeding of the infant during the first six months of life. Teething makes a great demand on the nervous as well as the physical side of the child, so the more care that has been taken to build up the little body the more chance the child will have of weathering the teething period successfully. Perfect cleanliness is, of course, essential, and the mouth should be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

gone over carefully with a piece of cotton-wool dipped in dilute boric acid. Twice a day should be sufficient for this method of cleaning, until the child is old enough to have a little soft brush of his own. The child usually dribbles a great deal of saliva so that it is necessary to change the bib frequently. There is always a certain amount of irritation, and perhaps inflammation, in the gums during the process of teething, even in healthy children, but in weakly children these conditions may be much more exaggerated. A hard, clean ring on which to bite is beneficial and soothing. The child may be restless, with slight fever and lack of appetite, or there may be greater general disturbances—sickness, diarrhœa, skin eruptions or even convulsions. If the gums are inflamed they should be gently rubbed with the fore-finger dipped in boric acid and glycerine, and incision of the gums may have to be carried out in difficult cases. The first teeth should be cared for in every way, as this tends to improve the health and the regularity of the formation of the permanent set.

TEMPERATURE.—Temperature means the degree of intensity of heat in the body; the normal temperature of the body in a state of health is 98.4° F. It usually fluctuates about 2° in the twenty-four hours, being lowest between two and six a.m. and returning to normal about mid-day; it then becomes slightly higher in the evening and reaches normal again about midnight.

The temperature in warm-blooded animals, including man, remains fairly constant whatever the temperature of the air, but the temperature of cold-blooded animals, such as snakes and fishes, varies with their surroundings.

How to Take the Temperature.—A good clinical thermometer, ranging from 94° to 110°, should be used. Before taking the temperature the thermometer should be shaken so that the mercury will fall to its lowest point. The thermometer should be inserted under the patient's tongue and kept there, with the mouth closed, for about five minutes. The reading should be recorded on a chart, and the thermometer disinfected before returning it to its case. The temperature should never be taken immediately after the patient has had a hot drink.

TENO-SYNOVITIS. — This means chronic inflammation of the tendon sheath; it is met with frequently about the wrist or the ankle-joint. It may result from a sudden severe strain, such as jumping from a height. The pain comes on suddenly and the tendon is swollen and tender and when moved there is a creaking sensation caused by friction between the tendon and the sheath.

Rest is the most important part of the treatment and hot fomentations may be applied. As soon as the swelling goes down, the part should be massaged and painted over with iodine. If the trouble has been in the wrist, a wristlet should be worn for some time.

TETANUS. — An infectious malady which sets up rigidity in the muscles so that the limbs become fixed and the jaw locked. (*See* LOCKJAW.)

TETANY.—A disease characterized by intermittent, painful spasms of the muscles, especially of the upper extremities. It occurs in epidemic form and is more common among children than adults; rickety children especially suffer from this complaint. The cause of the disease is thought to be a calcium deficiency in the blood. It is usually the arms and legs that are affected; the arms are flexed across the chest with the fingers extended and the thumb contracted in the palm, and the legs are extended with the feet and toes flexed. The temperature may be raised and the pain is sometimes very severe. The spasms may last for a few hours or the condition may go on for months, the attacks recurring at intervals. Child-crowing usually indicates tetany.

It is essential to give adequate calcium, usually by injection. Warm baths are to be recommended and often relieve the spasm as in child-crowing. Bromide of potassium and chloral hydrate may be employed. Cold sponging, massage and electrical treatment may be tried. The bowels should be attended to; castor oil may be given or, if necessary, an enema may be used.

THERMOMETER, CLINICAL. — An instrument for measuring the intensity of the body heat.

THREADWORMS.—*See* WORMS.

THROAT, FOREIGN BODIES IN.—*See* FOREIGN BODIES.

THROAT, SORE.—*See* LARYNGITIS *and* PHARYNGITIS.

THRUSH.—This affection is due to the growth of a fungus, *oïdium albicans*, in the mucous membrane of the mouth. Improper diet, uncleanness of the mouth, or fermentation of the remains of food, may be the cause of the complaint. It is frequently transmitted by unclean feeding bottles or spoons, etc. The disease begins on the tongue and appears in the form of round white spots which increase in size and gradually join together. These spots spread to the cheeks, lips, tonsils and pharynx and may even extend into the gullet and the stomach. The mouth is usually very dry.

Treatment.—The mouth should be kept scrupulously clean and, if the child is bottle-fed, everything should be sterilized.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The patches of thrush can be pulled off, rather like pieces of dirty blotting-paper, and the mouth should be washed out with borax solution made up of 10 grains to the ounce of water.

THYMUS GLAND.—*See* GLANDS.

THYROID EXTRACT.—Extract of the thyroid gland. (*See* ORGANOTHERAPY.)

THYROID GLAND.—*See* GLANDS.

TIC DOULOUREUX.—*See* NEURALGIA.

TICS.—A tic is a convulsive movement which may begin involuntarily but later become habitual and purposeless. One of the most common forms of tic is the blinking of the eye; others are nodding of the head, scratching, rubbing, licking of the lips, etc. They are associated with nervous instability, though in some cases fatigue alone may be the cause.

TINNITUS.—*See* EAR, DISEASES OF.

TOBACCO.—*See* NARCOTICS AND HYPNOTICS.

TOENAIL, INGROWING.—*See* NAILS, DISEASES OF.

TONGUE, APPEARANCE OF, IN DISEASE.—The tongue usually gives evidence of the state of a patient's health. A flabby tongue, with a thick layer of brownish fur, usually indicates the need of a good purge. In fevers, especially in typhoid, the tongue becomes fissured down the centre with fur around the edges while the tip remains red. In scarlet fever the tongue is covered with white fur through which appear a number of red spots which gives it the name of "strawberry tongue." Sore spots or ulcers may be an indication of syphilis, but on the other hand they may be due to indigestion. In cases of paralysis, the tongue usually appears to shrink, especially on one side, and when it is put out it tends to be pushed towards one side.

An ulcerative inflammation of the tongue may be present in cases of tuberculosis. Tremor of the tongue is usually present in cases of chronic alcoholism, but may also be present in cases of nervous disease. A thin white fur may be present in conditions of good health, but may be due to too much smoking.

TONGUE, INFLAMMATION OF.—Glossitis is the medical term for this affection. The tongue swells and there is severe pain and the patient has great difficulty in swallowing. The inflammation usually lasts for about four days and within ten days the symptoms may have disappeared entirely.

Treatment.—The bowels should be attended to, and the mouth should be washed out with hot water, to which has been added chlorate of potash (15 grains). If an abscess is present, the surgeon should incise it. The patient should be fed with warm liquids, such as milk and water, in small quantities and at frequent intervals.

TONGUE-TIE.—This condition is said to be present when the fold or frænum running from the under surface of the tongue to the floor of the mouth is shorter than normal. Snipping the edge with a pair of scissors will generally put matters right, but this should not be attempted by an unskilled person.

TONSILLITIS, ACUTE.—Inflammation of the tonsils is not only a common complication or symptom of many fevers, but it is also a common primary affection. In the rarer cases where the inflammation continues to suppuration it is popularly termed "quinsy."

Acute tonsillitis may occur at any age, but is common in young people. It is often associated with, or precedes, acute rheumatism.

Symptoms.—The disease is sudden in onset. The throat is hot and dry and the temperature rises rapidly to about 104° F. The tongue is dirty and the breath fœtid. There is much pain on movement of the lower jaw. The glands below the jaw are enlarged and tender. There may be yellowish patches of pus over the surface of the tonsil. The remainder of the soft palate and uvula will also be inflamed; the yellowish patches are confined to the tonsil. In diphtheria a membrane is formed which is somewhat similar in appearance to the exudation of pus, but it usually spreads beyond the confines of the tonsil to the surrounding tissues.

Treatment.—For the septic condition of the throat a free chlorine gargle every four hours is very useful. A cold compress—e.g. a handkerchief soaked in cold water—round the throat is very comforting. General measures include starting with a purge, such as 2-4 grains of calomel followed by a couple of teaspoonfuls of Epsom salts in the morning. Medicine containing salicylate of soda (10-15 grains) every three hours should be given. Food should be "thick," like arrowroot, custard, well masticated bread and butter, etc., as this is easier to swallow than fluids. It is easier to swallow fluids through a straw than to swallow them direct.

TONSILS, ENLARGED.—The tonsils are a part of the lymphatic tissues of the body, and as such are fairly prominent when the lymphatic tissues are most active, e.g. during growth up to puberty, and tend to atrophy after.

The temporary enlargement as mentioned above must be distinguished from a true hypertrophy or one due to inflammation. The tendency to enlarged tonsils appears to run in families. The enlargement may occur as the result of scarlet fever, measles, diphtheria, whooping cough, influenza, or smallpox, or repeated attacks of tonsillitis.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

As a rule the tonsils enlarge when the child becomes about three or four years old, and hypertrophy does not commence after puberty.

Symptoms.—The tone of voice is frequently thick and woolly. Articulation is apt to be indistinct. There may be catarrh at the back of the throat. The glands of the neck are often enlarged, and are very liable to be infected with the tubercle bacillus. Indigestion is usual. The patient complains of foul breath and a "rotten taste" in the mouth, or of being able to spit out masses of cheesy matter. General health is usually poor.

Treatment.—The most satisfactory way of dealing with enlarged tonsils is to remove them surgically. Short of this, painting with 2 per cent iodine solution, 2–5 per cent silver nitrate, gargling and syringeing with alkaline and antiseptic lotions, and galvano-cautery, are all useful.

Attention to general health is very important, e.g. iron and arsenic tonics, Parrish's food, cod-liver oil and malt and, if possible, a holiday at the seaside should be taken. This may prove beneficial by helping to reduce slightly overgrown tonsils.

TOOTHACHE.—*See* TEETH, DECAY OF.

TOPHI.—Hard, stone-like deposits occurring in gout.

TORTICOLLIS.—A contraction of one or more of the cervical muscles, usually of one side, resulting in an abnormal position of the head. (*See* WRY-NECK.)

TOURNIQUET.—An instrument for controlling the circulation by means of compression. There are several types of tourniquet, but the simplest form consists of a handkerchief used as a pad and placed on the artery at the point most suitable for applying pressure. The pad is kept in position by a bandage which is tied lightly round the limb. A piece of stick or metal rod is then passed between the bandage and the limb and is turned round and round so as to tighten up the bandage by twisting it. It is essential that no tourniquet ever be left tight for more than 20 minutes at a time. (*See* HÆMORRHAGE.)

TOXÆMIA.—Blood-poisoning. A condition in which the blood contains poisonous products, either produced by the body-cells or due to bacteria.

TOXIN.—A poison in the blood.

TRACHEOTOMY consists in cutting down upon the windpipe, making an opening into it, and fixing there a bent tube in order that air can enter freely into the lungs when the larynx is obstructed. It used to be done most commonly in diphtheria, but with the introduction of antitoxin it is much less frequently necessary nowadays. Severe inflammation or a growth of the larynx or throat may block the windpipe so much that a tracheotomy may be necessary. After the tube has been fixed in, care must be taken to keep it clear of discharges and free of obstruction.

TRANSFUSION OF BLOOD. — This operation is carried out in cases of severe hæmorrhage. The blood is transfused from a vein or artery of a person who consents to be the "donor" into one of the patient's veins. Blood is divided into various classes and the donor's blood must be of the same type as the patient's. Transfusion centres have been established, and much use has been made of "stored blood"; that is, blood kept in refrigerators ready for use.

TREMORS.—Tremor, or trembling, is present in many diseases of the nervous system, or it may be a symptom of debility. It may occur as a result of too much alcohol or as the result of certain medicines. It is often present in old age, in which case the condition would not be amenable to treatment. Much can be done for the condition by bringing the health up to par by tonics and good feeding.

TRENCH FEVER.—This condition was first recognized during the First World War, and as the organism is transmitted by the louse, the disease is not likely to become prevalent in civil life. The disease usually commences with chilliness, headache and general pains. In most instances the fever may last for a few days, then the symptoms will subside for a period before starting up again. These periods of recurrence are characteristic of trench fever. Burning pain is felt in the shins, knees, elbows and shoulder-blades, and there is great tenderness, although no swelling or redness is present. Complete rest is essential and local applications of a saturated solution of magnesium sulphate may sometimes give relief.

TRIANGULAR BANDAGES. — *See* BANDAGES AND BANDAGING.

TRICHIASIS. — *See* EYELASHES, INGROWING.

TRICHINOSIS.—This disease is produced by a tiny worm, the trichinella spiralis, which is usually communicated to man through imperfectly cooked flesh. The embryos pass from the intestines and enter the muscles, where they finally settle. It is during the migration of the embryos that the symptoms are produced. In the course of a few days after the infected meat has been eaten, signs of gastro-intestinal disturbance arise. There is pain in the abdomen, loss of appetite, vomiting and sometimes diarrhœa. In some cases general debility and pain in different parts of the body have been noted. There is usually fever of an intermittent character, the temperature rising to 102° or 104° F. Swelling of the muscles is a very prominent

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

feature, and profuse sweating and itching of the skin may be present.

Treatment.—As soon as the patient begins to feel ill the stomach should be thoroughly cleared by an emetic. Calomel should be given at once and a few hours after the second dose castor oil should be given and repeated if necessary. Large doses of glycerine may be administered or turpentine tried in full doses. The patient's strength should be maintained and the pain in the abdomen may be relieved with hot-water bottle or hot fomentations.

TRIONAL.—*See* NARCOTICS AND HYPNOTICS.

TROPICAL ANÆMIA.—*See* MINER'S ANÆMIA.

TROPICAL LIVER.—This term covers all the irregularities of the liver that are frequent in hot climates. The liver may become congested through eating too rich food or drinking too much alcohol. The congestion may develop into acute inflammation accompanied by pain and fever. The patient usually becomes thin and pale and may develop into a chronic invalid.

Treatment.—The patient should go to bed and purges must be given. The diet should consist mainly of milk and when inflammation is present hot poultices should be applied over the liver region.

TRUE CROUP.—*See* CROUP.

TRYPANOSOMIASIS.—This disease is communicated to man by the bite of the tsetse-fly. It is very prevalent in Africa and it is also met with in parts of South America. The patient has intermittent feverish attacks, and there is loss of weight and dullness of mind. In the second stage of the disease there are tremors in which the gait becomes shuffling, also tremor of the tongue and hands, and the speech becomes markedly slower. Lastly the temperature falls and the patient becomes lethargic and passes into what is known as the sleeping-sickness stage, and gradually dies from sheer weakness and exhaustion if no other complication has intervened. It is only in the earlier stages that treatment can do more than delay death. Antimony has been effectually given intravenously, and the German preparation "Bayer 205" has also shown good results.

TUBERCULIN.—*See* TUBERCULOSIS.

TUBERCULOSIS. — An infectious disease due to the bacillus tuberculosis discovered by Koch. The bacillus is very hardy and when coughed from an infected lung may remain alive for several months. Fortunately it is soon killed by the action of strong sunlight. There are three main varieties—human, bovine and avian. In the human being the disease is contracted either by swallowing milk infected with the bovine type or by inhaling the germ from infected human sputum or anything infected by sputum. Once in the body, the bacillus forms a small nodule or tubercle, which is either scattered throughout all the organs or settles down in colonies or masses. The former is known as miliary tuberculosis, and becomes fatal rapidly. The latter is known as tuberculosis infiltration, and is most generally seen in infection of the lung, or phthisis, when the central portion tends to die, looks "cheesy" and breaks down, forming cavities. Tuberculous infection of the skin usually results in lupus vulgaris, and infection of mucous surfaces causes ulceration.

The bacillus is often inhaled with infected dust, or swallowed in contaminated milk. The germ may lodge in the tonsils and pass from these to the nearest lymphatic glands — those in the neck — causing cervical adenitis. These swollen glands may turn into abscesses.

If swallowed, the germ passes through to the intestines. The acidity of the gastric juice prevents the formation of any tubercles in the stomach, but in the intestine it may pass to the intestinal lymphatic glands (consumptive bowels) to the peritoneum (peritonitis—chronic); via the bloodstream to bones; joints; the suprarenal glands (*see* ADDISON'S DISEASE). At any time spread may be rapid through dissemination via the blood or lymphatic streams, and in this way the membranes of the brain may be infected (tuberculous meningitis).

Treatment.—General health is most important. This is best attended to by sanatorium treatment, fresh air and sunlight, good food and carefully regulated exercises.

Tuberculin is an extract of cultures of the bacillus. It is of some use in selected cases as a means of treatment, and it is also used as a method of diagnosis; a dilute preparation is injected into an infected individual and a reaction is obtained which differs from that in a healthy individual. The scourge of tuberculosis is the first of all diseases where prevention is better than cure. The new drug streptomycin shows great promise in its treatment.

TUBERCULOSIS OF BONE.—In this case the bacillus tuberculosis settles down in a bone in which the vitality is temporarily lowered as a result of injury or disease. It grows and causes chronic inflammation. An abscess may be formed and a swelling in the bone will be noticed. "Starting pains" or sudden contractions of the muscles as the patient is dropping off to sleep are often complained of. The adjoining joint is usually implicated.

Treatment consists in rest and plenty of good fresh food, sunshine, with cod-liver

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

oil and malt. Special splints or operation may be necessary.

TUBERCULOSIS OF THE HIP usually occurs in children who are not very strong and often follows a slight injury to the hip, such as a bruise or a blow. The early signs are general, e.g. the child is not well, sleeps badly and has a poor appetite. He may be noticed walking with a slight limp. Running and jumping are difficult.

Symptoms are at first limitation of movement, and later an alteration in the position of the limb when at rest. The thigh is bent upward and drawn away from the sound hip. There may be some wasting of the muscles of the thigh and of the buttock on the affected side. There is also pain in the hip or knee.

Treatment.—Complete rest of the affected joint must be obtained by placing the child in a splint—including the bad hip and the sound hip as well as the knee on the affected side. The leg is placed in an abducted position so as to avoid subsequent deformity. General treatment as for tuberculosis must be carried on at the same time and continued for several months. Operation on the joint may be necessary.

TUBERCULOUS MENINGITIS is often a terminal phase of any form of tuberculosis in a weakly child. The younger the child the more likely is it to succumb to tuberculous meningitis.

Symptoms. — The attack begins with vomiting and convulsions. The child sometimes screams continually or utters sharp cries. The temperature rises to 101°-103° F. The child usually lies on his side huddled up and soon loses consciousness. There may be remissions, but it nearly always ends fatally. (*See* MENINGITIS.)

TUMOURS.—A tumour is a localized swelling composed of newly formed tissue which fulfils no physiological function. Tumours increase in size quite independently of the growth of the body, and there is no natural termination to their growth. Various factors are concerned in their development; in some cases there is some innate malformation of the particular tissue from which they arise (nævi) or from small nests of embryonic cells which have remained dormant amongst fully formed tissue elements, and are suddenly activated. Chronic irritation and possibly injury may start these cells growing. Heredity also appears to be a factor.

Tumours are of two main varieties, the innocent and the malignant. In the case of the innocent tumours the evil effects are entirely localized and depend on their pressure effect on their immediate environment. Malignant tumours, in addition to similar local effects, are able to transfer themselves and grow in other parts of the body. They injure the health generally and ultimately cause death.

Innocent tumours are of many varieties and present a close resemblance to the normal tissues of the body, e.g. adenomas (tumours of glandular tissue), chondromas, of cartilage; fibromas—of fibrous tissue; lipomas—of fatty tissue; myelomas—of marrow; myomas—of muscle; papillomas—of epithelium (*see* WARTS); neuromas—of nerve tissue; gliomas—of the connective tissue which binds the nerve cells and fibres together.

Malignant tumours grow more rapidly than innocent tumours, infiltrate their surroundings, have no definite capsule, and show a marked tendency to spread to other parts of the body, where secondary growths (metastases) occur.

In time malignant tumours give rise to general ill-health (cachexia) and ultimately cause death either by the cachexia, by intercurrent illness, such as pneumonia, or by ulceration and hæmorrhage, or by their presence and infiltration interfering with the functions of organs which are essential to life.

Treatment.—Early operation for the complete removal of the growth is the only hope of permanent cure.

Radium, X-rays or newer substances, such as stilboestrol or H 11 extract will sometimes slow down or even completely eradicate malignant growths.

TURPENTINE POISONING. — For treatment give an emetic (*see* EMETICS), also a dose of Epsom salts (½ oz.). Milk, white of egg or barley-water may be given.

TWILIGHT SLEEP.—This condition is induced in a woman in labour by the injection of hyoscine and morphia. The patient becomes unconscious or semi-conscious, but during the labour pains she may moan as if conscious of the pains, although later on she will have no recollection of them. Whether the treatment is advisable is for the doctor to decide; it is useful in certain cases, but it has drawbacks.

TYMPANITES. — Abdominal distension due to gas in the intestine.

TYMPANITIS. — Inflammation of the middle ear.

TYPHOID FEVER.—Also known as enteric fever.

A specific infectious fever marked by diarrhœa and a rose-coloured rash (appearing in successive crops) running a prolonged course of about twenty-one days and ending gradually. It is accompanied by characteristic ulceration of the small intestine and enlargement of glands. It may occur at any age, but is most common between the ages of fifteen and twenty-five.

Cause.—The bacillus typhosus is the causal organism, and when swallowed will

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

give rise to the infection. It is conveyed by:

(1) Contaminated water or ice. This includes raw greenstuffs, such as salads washed by the contaminated water.

(2) Shell-fish, especially oysters which are grown in river beds contaminated with sewage containing the bacillus.

(3) Contaminated milk.

(4) Direct contact with the stools of patients.

(5) Soiled linen of patients in public laundries (stools or urine).

(6) Contamination of the soil through defective drains.

(7) Typhoid carriers: under this heading are included people who have recovered from the disease and yet the bacilli persist in the intestine, gall-bladder and prostate gland, from which at intervals they discharge either into the fæces or into the urine.

Symptoms.—Ten to fourteen days after the infection (incubation period) the patient complains of headache and of increasing weakness until he is compelled to take to his bed.

First week: The temperature rises in a "staircase manner," e.g. it goes up two degrees in the evening and falls one in the morning. The bowels are often constipated at this stage and there is some tenderness in the right side over the region of the appendix.

Second week: The spleen becomes definitely enlarged. The temperature remains at a high uniform level, and the patient becomes very weak—the "typhoid state," and rambling delirium may occur. Diarrhœa is usually marked at this stage. The stools are liquid, fœtid and pea-soup-like in appearance. They often contain blood, shreds of mucous membrane and sloughs. If hæmorrhage occurs the stools become black or what may be described as "tarry" in appearance.

The rash comes out in successive crops of small rose-coloured spots slightly raised above the surface. They fade on pressure. They are present on the shoulders and back only. Each spot lasts about four days. In 30 per cent of cases there is no rash at all.

Third week: The general symptoms are often more marked. Ulcers in the small intestines are liable to perforate. Intercurrent illnesses such as attacks of pneumonia may arise and cause death.

Fourth week: The temperature gradually becomes normal and convalescence can be said to begin.

Relapses often occur about the tenth day of convalescence, but these are fortunately fairly mild and brief.

Varieties of typhoid fever:

(*a*) Ambulatory cases where the patient is not sufficiently ill to go to bed: "ambulatory."

(*b*) Cases with sudden onset and often marked headache.

(*c*) Cases which end suddenly at the end of the second week: "fourteen-day fever."

(*d*) Cases which continue for five or six weeks before convalescence.

The most important complications are:

(*a*) Hæmorrhage: usually the result of the perforating process going on in the bowel. It may also occur from a mucous surface, such as the nose.

(*b*) Perforation: this may occur even in mild cases. The only treatment here is operation to sew up the bowel.

(*c*) Peritonitis: always a complication of perforation, it may also be found where there is no perforation.

(*d*) Excessive distension of the abdomen.

(*e*) Lung complications, such as bronchitis and pneumonia.

(*f*) Kidney inflammation.

(*g*) Bed-sores.

Treatment.—The most important factor here is good nursing. The various symptoms are treated as they arise, e.g. tepid sponging for the fever when it is uncomfortable for the patient. Phenacetin (grains 4) for headache; constipation, by enemas of olive-oil or glycerine; diarrhœa, by injections of weak starch and water, etc.

Diet.—Milk should be the basis. To this can be added white of egg, beef-tea and chicken broth. For thirst give water, mineral waters and lemonade. Arrowroot, corn-flour, custard, mashed potato and thin bread and butter, whipped eggs, etc., can be added as the patient's condition improves.

If hæmorrhage occurs morphia must be given to check all movements of the bowel, and the diet must be reduced and confined to the most digestible foods.

Anti-typhoid serum has been used successfully. Vaccines are also useful.

Prevention.—A vaccine consisting of the dead organisms, given in two doses with an interval of ten days between. This resulted in greatly diminished incidence in the British Expeditionary Force of 1914.

Varieties of the bacillus typhosus are known as paratyphoid bacilli. They cause a disease similar in all respects, but usually less severe in type. These strains should be added to the vaccines when used for prevention. The causal organism can be grown from the blood during the first ten days of the illness, and then the proper serum or vaccine can be given as a method of treatment.

TYPHUS FEVER.—This fever seems to flourish in conditions of dirt and overcrowding, and in the old days it was very

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

common in jails and camps. Modern sanitary arrangements and improvements have now largely stamped out this disease. It is exceedingly contagious and the fever seems to be spread through the bites of lice.

The onset is sudden and the patient feels pains all over the body, headache and chilliness. The temperature rises rapidly to about 104° F., and a rash appears about the fourth day. It consists of mottled spots, described as resembling mulberries. The patient may remain in a dazed or delirious condition up until the time of crisis, which occurs about the twelfth day. The patient may wake free from delirium and fall into a deep sleep, the temperature may drop rapidly and recovery is usually quite rapid. The windows in the room should be well open as the odour from the patient is of a most objectionable nature; if possible treatment should be carried out in a tent or at least as much in the open air as possible. Water should be given freely to the patient; but see that the bladder is emptied regularly. The diet should consist of milk and nourishing soups given to the patient every three hours.

ULCER.—This means a loss of substance occurring on the skin or mucous membranes and due to a gradual breaking down of the tissues. There are many varieties of ulcer and the following are a few of the more important types: the adherent ulcer is so called because the base adheres to the underlying tissues of the skin; necrotic, an ulcer producing gangrene; endemic, an ulcer usually local as regards countries; varicose, in a limb where vitality is impaired by varicose veins; hard, a chancre; indolent, an ulcer slow to extend or to heal; perforating, an ulcer that perforates the tissues. The healing of an ordinary ulcer may be promoted by applying boracic ointment.

ULCERS OF STOMACH. — See STOMACH, ULCERS OF.

ULCER, RODENT. — *See* RODENT ULCER.

ULCERATIVE COLITIS.—Ulceration of the bowels is almost always present with typhoid fever and dysentery. Consumption in children is often confined to the bowel. In adults ulceration of the bowels may be set up through swallowing the sputum from an infected lung, but more commonly infection is due to bacillus. Colistasis from chronic constipation is nearly always a predisposing factor. There is usually pain and diarrhœa, and the stools are mixed with mucus, pus and blood. The pains are of a colicky nature, usually severe, but motions may be passed without any pain at all. The patient may show signs of wasting and [illegible] disease may run on for about six weeks to three months; but some cases seem to become almost constitutional, and although the patient may pass large quantities of slimy mucus, and even blood-stained stools, no other symptom may appear and the patient may be able to lead an ordinary working life. Modern treatment is by means of sulpha-drugs.

UMBILICAL RUPTURE. — *See* RUPTURE.

UNCONSCIOUSNESS. — A state of being without sensibility; this may come about in many different ways. No fluid should be administered to an unconscious person, as there is great danger of its entering the windpipe instead of the gullet, and the patient may die from suffocation. If injury is present in the unconscious person, great care should be taken to lay the patient in the most comfortable position, but in cases of fracture the patient should not be moved until medical aid can be found. In cases of fainting, the head should be lowered in order to allow the blood to circulate to the head. All tight clothing should be loosened or removed and as much fresh air as possible should be admitted to the room. If the patient collapses out of doors, it would be advisable to protect him until he recovers consciousness.

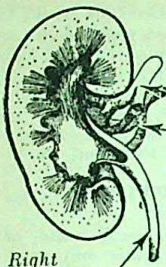
UNDULANT FEVER.—This disease is more commonly known as Malta fever, Mediterranean fever or Rock fever. It is certainly to be found in various parts of India and China as well as the Philippines, so the name Malta fever is a little unwarranted. It is due to a specific germ, the Brucella abortus, which is believed to be conveyed through the medium of goat's milk. The symptoms are loss of appetite, headache, insomnia, and rise of temperature; in the evenings neuralgic pains and swellings of the joints appear. It may be a long-drawn-out illness resulting in exhaustion and emaciation of the patient. There is no specific treatment for this fever. Cold sponging may be carried out, especially if the temperature is very high. The diet should be light and milk may be given in quantity, and an iron tonic should be given during the convalescent stage.

URÆMIA.—When the poisonous substances normally excreted in the urine are retained in the blood, the train of symptoms which is set up is known as uræmia. The chief symptoms are vomiting and diarrhœa, headache, shortness of breath, convulsions, and mental excitement going on to coma and often death. The condition usually comes on in chronic Bright's disease, but may occur in other forms of kidney disease.

Treatment.—The first object should be [illegible] the skin and bowels to excrete as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



much waste matter as possible. A hot-water enema should be given, followed by a good dose of Epsom salts. To induce sweating hot fomentations should be administered or, if the patient is not too ill, he should be placed in a hot bath. An injection of pilocarpine may be given to increase sweating, but this should be subject to medical advice. Subsequent treatment should be the same as for Bright's disease.

UREA. — The chief nitrogenous constituent of urine.

URETERS.—The long, narrow tubes conveying the urine from the kidney to the bladder. (*See* URINARY ORGANS.)

URETHRA, STRICTURE OF.—Stricture is most commonly the result of an attack of gonorrhœa, but it may be due to other causes as well. The condition generally comes on gradually and the patient finds increasing difficulty in getting the bladder emptied. The treatment depends on the nature of the stricture, but medical attention is always necessary.

URETHRITIS.—Inflammation of the urethra.

URIC ACID.—An acid found in the urine and in the blood.

URINARY CALCULI.—*See* STONE IN THE KIDNEY.

URINARY ORGANS. — The urinary organs are the kidneys, the ureters, the bladder and the urethra. The kidneys, which are situated at the back of the abdominal cavity, separate the urine from the blood; the urine then passes along the ureters, which are a pair of tubes opening into the bladder. The bladder, which lies within the pelvis, is the reservoir for the urine, which finally passes by a tube—the urethra—to the exterior.

URINE, INCONTINENCE OF. — In some cases the constant trickle of urine may be due to weakness, as in old age. Displacement of the womb in women is a common factor, also paralysis. Surgical treatment is beneficial in most cases. For incontinence of urine in children, *see* BED-WETTING.

URINE, NORMAL AND ABNORMAL. —Normally about 2½ pints of urine are secreted in the 24 hours, but the quantity varies greatly in accordance with the quantity of fluid taken. In hot weather much of the water portion of the blood is secreted through the skin, so that the quantity of urine is lessened; in cold weather, when the body does not perspire so freely, the quantity of urine is greater. A very common deposit in the urine is that of urates, a salmon-pink deposit at the bottom. This is not a serious condition, but may merely mean that the urine has become more concentrated owing to lack of exercise, or perhaps less fluid has been taken than usual. Uric acid may appear rather resembling grains of cayenne pepper; this means too much acidity in the blood and tendencies towards gout. Phosphates in the urine take the form of white, fluffy deposits, and usually indicate a state of nervous exhaustion.

Albumin in urine.—This may be detected in urine, and is owing to the consumption of too much animal food. If it persists, Bright's disease may be indicated.

Bile in urine.—This produces a greenish appearance and is present in cases of jaundice.

Blood in urine.—This gives the urine a brown, red, or smoky colour. It may be present in cases of fever, Bright's disease, and in various kidney diseases.

Pus in urine.—The urine is usually turbid when pus is present and the odour is offensive. This is usually an indication of inflammation of the bladder.

Sugar in urine.—Enormous quantities of clear, sweetish urine may be passed which indicates too much sugar in the blood; this is a symptom of diabetes.

URINE, RETENTION OF.—If the patient is unable to expel the contents of the bladder the doctor should be sent for. The pain may be relieved by a hot bath or a hot-water bottle.

URINE, SUPPRESSION OF. — This condition is not quite the same as retention of urine. Here the kidneys have ceased to function, so no urine can be secreted. It is an indication of Bright's disease, or it may be the result of a prolonged operation. In cases of hysteria the urine may be suppressed for a few days.

URTICARIA.—This condition is more easily recognized under the name nettle-rash. Weals appear on various parts of the body, rather like those produced by the sting of a nettle; they are very irritating and itchy. Certain articles of food are liable to produce this rash, but it may also be caused by indigestion, jaundice, gout, malaria, or nervous debility.

Treatment.—If the attack is caused by unsuitable food, the bowels should receive attention; an emetic may be given if necessary. In feverish cases, the patient should remain in bed with light but warm bed-clothes on, and the diet should consist chiefly of milk. Sometimes a change in the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

form of a holiday may do the patient a great amount of good.

UTERUS, DISPLACEMENTS OF.—*See* WOMB, DISPLACEMENTS OF.

UTERUS, INFLAMMATION OF.—*See* WOMB, INFLAMMATION OF.

VACCINATION. — Inoculation with the virus of a disease in order to protect against that disease. By vaccination, an immunity is set up in the blood which lasts for a period of years, and if the patient is exposed to infection during that period the disease will either not be contracted or, if it is, in a much milder form than would otherwise be the case. The advantage conferred by the widespread adoption of vaccination, especially in the protection against smallpox, has been proved beyond doubt, and it is quite probable that if it was compulsory that revaccination should take place periodically, the disease would disappear in the communities so protected. In England, it is compulsory by law for every child to be vaccinated within six months of birth, unless the parent makes a statutory declaration to the vaccination officer that there is a conscientious belief that vaccination would be prejudicial to the child's health. This is a concession that is very much abused by many thoughtless people refusing to do their duty to the young child and to their fellow creatures by having this very simple little operation performed.

The most suitable age for vaccination to take place is in infancy before the first teeth begin to appear. A very strong and robust child could be vaccinated very soon after birth, but in the majority of cases the preferable time is when the child is between two and six months old. A "good take," as it is called, will give protection for a number of years. Exaggerated stories of the dangers of vaccination may reach the ears of the parents of the newly born child, but these should be carefully investigated and weighed in the balance with the immense amount of good that is done by vaccination of the population as a whole. It has been suggested by an authoritative committee that after the vaccination in infancy, the child should again be done at the age of five to seven, which is the usual age of entering school, and again between the ages of fourteen and sixteen. The duration of protection is taken to be between five and seven years.

It is very remarkable that in our closely packed industrial centres, when the proportion of vaccinated persons in a town falls below a certain percentage, there inevitably follows an outbreak of smallpox, so it is advisable that the civilian population should agree to be revaccinated periodically.

VACCINE AND SERUM TREATMENT.—A vaccine is any substance used for preventive inoculation. The principle of preventive inoculation is that when a germ or toxin or poison finds its way into the blood, certain constituents of the blood which are antagonistic to the germ or poison are increased in number in order to fight the invading poison. This heightened resistance is called immunity. The vaccine which is inoculated is composed of dead bacteria or their poison. They are used preventively in smallpox, typhoid fever, hydrophobia, etc., but remedially they are used nowadays for almost any form of disease which is due to the action of bacteria. A vaccine which is made of a culture taken from the patient's own discharges is called an autogenous vaccine. (*See* IMMUNITY.)

VACCINIA. — Cowpox. A contagious disease of cows transferable to human beings through vaccination. It conveys immunity from smallpox.

VAGINA.—The canal in the female extending from the cervix of the womb to the vulvar opening.

VAGINAL DOUCHING.—Washing out the vagina by means of a douching apparatus or spray is recommended in cases where there is any abnormal vaginal discharge, as after childbirth, in gonorrhœa, etc. Many women find it more comfortable to douche for a day or two after a period has finished. Warm water with a very mild disinfectant such as ordinary salt may be used.

VALVULAR DISEASE.—*See* HEART DISEASE.

VARICELLA.—*See* CHICKEN-POX.

VARICOCELE.—This condition is due to a swelling of the veins around the testicle. It is met with practically only in young men with large, lax scrotums, and the swelling seems to arise on the left side more often than the right. It may be brought about by masturbation, which induces an added flow of blood to the testicle. This affection produces a feeling of heaviness and pain of a neuralgic character in the testicle. The swelling can be felt with the fingers and may seem to feel rather like a bag of worms. In slight cases the treatment should consist of supporting the scrotum by wearing a suspensory belt; sponging the parts night and morning with cold water, and avoidance of constipation. In more marked cases a slight operation may be necessary, especially if the patient is going to be engaged in work which will require any muscular exertion.

VARICOSE VEINS.—The veins of the legs and thighs are the most commonly affected, and the condition is most

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

prevalent among persons whose occupation forces them to do much standing or walking. The fundamental cause is the weakness of the veins and valves, as the valves are unable to withstand any extra call upon the blood circulation so that they become incompetent and do not support the long column of blood. The result is that a certain amount of blood in the venous return becomes sluggish, and sometimes there is a back flow of blood so that the veins become dilated, lengthened and finally twisted. Anything restricting the limb, such as garters that are too tight, is a factor in aggravating varicose veins. There are other causes and amongst these are chronic constipation, pressure on the veins within the abdomen from tumours, or owing to pregnancy. The patient will have a feeling of weight and fullness in the limb after standing or after a long walk.

The bluish veins can easily be detected beneath the skin, and they may have distinct pouches here and there. There is usually pain, accompanied by a sense of weight and fullness, and the ankles may swell. Any scratch over a varicose vein may lead to the formation of an ulcer. There is always great danger of a blood-clot becoming detached and being carried by the bloodstream to the brain.

Treatment.—The cause of the affection should be removed if possible; constipation and the diet should be attended to. The wearing of a special stocking or bandage may prove helpful. The recent method of drying up the veins by an injection under medical supervision has shown very excellent results.

VARIOLA.—*See* SMALLPOX.

VEINS.—Blood-vessels which carry the blood from the tissues to the heart. (*See* CIRCULATION OF THE BLOOD.)

VELDT SORE.—Infectious sores, common in South Africa. They consist of hard pimples which later become pustular, finally bursting and leaving a yellow crust. The legs and the feet are the parts usually attacked. In order to relieve the itching, the sores should be washed in carbolic lotion (1 in 40), then dusted with boracic powder and covered with antiseptic lint or gauze until they heal.

VENEREAL DISEASE.—The principal venereal diseases are two in number, syphilis ('pox') and gonorrhœa ('clap'). They are usually contracted through sexual intercourse, and in syphilis especially the consequences are sometimes very far-reaching and unpleasant. Much work has been done by the Government to reduce the spread of venereal diseases, and free treatment can be had at most of the general hospitals under conditions of strict confidence.

VENEREAL WARTS.—A wart of the genital organs. (*See* WARTS.)

VENOUS BLOOD.—*See* CIRCULATION OF THE BLOOD.

VENOUS HÆMORRHAGE. — *See* HÆMORRHAGE.

VENTILATION.—Fresh air is as important to the human body as food. The fact that the body gives off impurities makes it necessary that the air in the rooms in which we live should be changed by ventilation. The windows should be always open from the top and wide open as often as possible. Draughts should be avoided, but an occasional draught is healthier than continual stuffiness. Too warm an atmosphere in a room tends to produce drowsiness and headache, and also encourages the activities of germs. There should be a fireplace in each room, as this acts as an outlet for impure air. To obviate the necessity of always opening and shutting windows during bad weather, special ventilators can be fixed into a pane of the window, which not only circulate fresh air into the room but draw the impure air out.

VERTEBRA.—One of the bones forming the spinal or vertebral column.

VERTIGO.—*See* GIDDINESS.

VISCEROPTOSIS.—This means dropping of the viscera or organs of the abdominal cavity. There are two varieties: congenital and acquired. In the first group the patients are usually young, more frequently women than men and usually of a nervous type. The symptoms are dyspepsia, throbbing in the abdomen, and dragging pains and weakness in the back. In the second group the abdominal wall is usually very lax and there may be an absolute lack of symptoms. In the majority of cases, a well-adapted abdominal belt is the only treatment needed; many cases are due to frequent pregnancies. If visceroptosis is of the congenital type, the neurasthenia should be treated, also any dyspepsia or constipation.

VITAMINS.—Substances present in the food which are necessary to the normal growth and health of the body. Five main groups of vitamins have long been recognized and classified, and more recently a great deal of further information has been obtained on this subject.

Vitamin A occurs in animal fats such as cod-liver oil, butter, cream and the yolk of egg. It is also present in green vegetables. It promotes growth. Its absence from the food will cause rickets.

Vitamin B is found in eggs, peas, beans, etc., yeast, milk, liver, brains, sweetbreads, kidneys, potatoes, fish. The absence of this vitamin causes beri-beri.

Vitamin C is found in fresh vegetables, oranges, lemons, grapefruit, cabbage,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lettuce, tomatoes. etc. Its absence causes scurvy.

Vitamin D, or anti-rachitic vitamin, occurs in cod-liver oil, fat of egg yolk and fat of milk.

Vitamin E is the breeding vitamin, found in vegetable oils, lettuce, meat and oats. Its absence is supposed to lead to sterility.

VITILIGO.—*See* LEUCODERMIA.

VITREOUS CHAMBER.—*See* EYE.

VITRIOL, OIL OF.—*See* SULPHURIC ACID.

VOICE, LOSS OF.—*See* APHONIA.

VOLVULUS.—A twisting of the bowel upon itself, causing obstruction. (*See* BOWELS, OBSTRUCTION OF.)

VOMITING.—This means the forcible ejection of the contents of the stomach through the mouth. Vomiting may be set up by chronic gastric catarrh, especially when due to alcoholism, or the presence of fermenting food in the stomach, poisons in the blood, or the onset of such fevers as measles, scarlet fever, yellow fever, etc. Vomiting may come from diseases of the liver, also from various troubles connected with the bowels, and morning sickness in women is usually due to pregnancy.

Treatment.—As vomiting is so often connected with some serious complaint, treatment should be directed towards the complaint. In cases where the vomiting is due to irritating food, it should be encouraged by administering quantities of warm water. In cases of morning sickness, or any sickness due to nervous disorder, a few drops of iodine in water may be found beneficial. So long as there is any irritability of the stomach, the diet should be of the lightest, consisting of milk and broths and jellies, etc.

VULVITIS.—Inflammation of the vulva, or opening of the front passage, may be due to a discharge from the vagina, or it may be set up by insufficient cleanliness, or to irritating urine, as in cases of diabetes, when there is apt to be very great itching and inflammation. The parts should be washed and thoroughly dried after water has been passed. General treatment should consist of washing the parts with dilute boracic lotion and dusting with boracic powder.

VULVUS WARTS.—Warts on the external female genital organs. (*See* WARTS.)

WARTS (Papillomata). — Warts are small hard tumours of the skin which may appear individually or in quite large numbers. The cause is not known, but in some cases they disappear as suddenly and as spontaneously as they appear. They may be snipped off with a pair of scissors or treated with salicylic collodion, or if they appear in great numbers they may be treated by X-rays. Other varieties of warts are the venereal warts which appear around the genitals, and sometimes under the armpits. Venereal and seborrhœic warts are treated in the same way as ordinary warts. Flat warts very often turn out to be the starting point of malignant growths, so careful treatment is advised. In women, warts may appear on the external genital organs for no apparent reason and the parts should be kept scrupulously clean, especially if there are any irritating discharges.

WASP-STINGS.—*See* BITES.

WASSERMANN TEST.—A test used in the diagnosis of syphilis.

WASTING IN CHILDREN.—Marasmus is the medical name for this complaint and means a gradual wasting of the tissues of the body from insufficient food supply. Children who suffer from worms, or who live under crowded conditions and obtain insufficient sleep, may fail to put on weight. Wasting occurs in any of the serious illnesses of childhood, such as tuberculosis, rheumatism or kidney trouble. Children of school age may lose weight if they have a long journey to and from school; also if they have worries.

Treatment.—It is most important to find, first of all, the cause of the trouble before ordering other remedies, and to get rid of that, and the wise parent will think about food, sleep and worms before worrying about tuberculosis or rheumatism. A good diet is of paramount importance. During the winter, cod-liver oil in the form of an emulsion should be given, and this will help the child to put on weight.

WATER BED.—*See* NURSING, DOMESTIC.

WATERBRASH.—Water may rise to the mouth from the stomach owing to badly digested food. The symptom often occurs in persons, especially women, who eat too rapidly. All food should be thoroughly masticated, and only a minimum of food eaten. This condition often comes under the term pyrosis (a Greek word meaning to burn); it is an affection of the stomach characterized by a burning sensation described under heartburn.

WATERY EYE.—*See* EPIPHORA.

WAX IN THE EAR.—*See* EAR, DISEASES OF.

WEANING.—This is the name given to the change from breast feeding to artificial food at whatever time during the child's first year it takes place. A child should not normally be weaned until the sixth or seventh month, but it may be necessary for an earlier change to be made. In any case, this change should not take place suddenly. A spoonful of groats given before the feed is admirable; then a milk drink instead of the breast. In turn, each breast feed can be replaced by such a meal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sudden weaning, besides causing much discomfort to the mother, is one of the most frequent causes of breast abscess.

The mother, too, should be considered and, if there is any sign that the feeding of the child is interfering with her health, the child should be weaned immediately, but the usual time taken in the changeover. It is a good idea to prepare the child for weaning by giving it one meal a day from the bottle, starting from about the fifth month. Some children, when weaned too suddenly, will refuse to take food for a time, but hunger often forces them to reconcile themselves to their changed habits.

WEBBED FINGERS AND TOES.—Webbed fingers should be separated by operation, but webbed toes need not be interfered with.

WEIGHT OF BODY. — *See* BODY-WEIGHT.

WEIR-MITCHELL TREATMENT.—*See* REST CURE.

WET PACK.—A wet pack may be either hot or cold. During fevers, in order to bring the temperature down, cold packs are very often administered. A mackintosh should be placed underneath the patient and sheets wrung out in cold water should be placed around him. Blankets should then be placed around and over the patient and the pack left on for about twenty minutes. If the temperature should drop below 100° F., the treatment should not be repeated. To give a hot pack, the room should be comfortably heated and all windows closed. Remove the patient's clothes and place a mackintosh underneath him and a blanket over him. Sheets should be wrung out in water at a temperature of 105° F., and quickly wrapped around the patient along with plenty of blankets to keep him warm; this may be kept on for about an hour. Care should be taken to make sure that the patient does not feel any draught when the hot wet pack is being removed.

WHITE LEG.—This is a complication which usually sets in about five to twenty days after labour. It is due to an inflammation of the veins of the leg; the womb is usually the site of the inflammation, but it spreads along the veins to the leg. There is a distinct rise in temperature and the patient may feel very ill indeed. The leg swells and becomes white and hard; the left leg is more often affected, but both are subject to it. The leg should be raised on a pillow and kept quite motionless and a cradle should keep the weight of the bedclothes from the leg. The diet must consist chiefly of soft foods and the bowels should be regulated with mild aperients. The patient may have to keep to her bed for many weeks and unless the leg is kept absolutely at rest there is great danger of a blood-clot being carried to the lungs or brain.

WHITLOW.—A whitlow is the term used for any acute inflammation of the fingers. It usually starts as an infection of the cuticle around the nail due to a slight scratch which becomes infected. This may spread to cellulitis of the fingers and may then infect the tendon sheaths so that the poison spreads upwards to the palm of the hand. In severe cases even the small terminal bone of the finger may necrose. Soaking the finger in hot water followed by hot boracic fomentations will usually clear the condition up, but if the abscess does not break it should be seen by a qualified medical man, who will probably incise it to let out the infection and pus. This is to avoid the infection spreading up into the palm of the hand and to the arm.

WHOOPING - COUGH. — Whooping-cough is essentially a complaint of young children, but adults are by no means immune. It usually follows an attack of bronchial catarrh and in young children it can be a very serious condition, especially in rickety or weakly children. This disease is of a highly infectious nature and is due to the *Haemophilus pertussis*, and the germs are spread about in the secretions of the nose and throat. The most infectious stage is during the early part of the disease, just before the actual whoop makes its appearance, and persons who have been exposed to infection should be quarantined for about three weeks.

The first stage is the catarrhal stage. The patient appears to have a bad cold in the head and chest and the throat is dry. This period usually lasts for about ten days, and the cough, which is worse at night, suddenly develops the typical whoop, by which all doubt is removed as to the nature of the disease. The cough occurs in paroxysms of short barks which often leave the patient black in the face. During the paroxysms no air has been entering the lungs and when the spasm is over and the patient finally takes a long, deep breath, the characteristic whoop is heard. Several of these attacks or spasms may follow one another rapidly, and relief is not obtained until the patient has brought up a quantity of thick, sticky phlegm, or vomiting has occurred. Crying or eating are liable to bring on an attack, and the pitiful efforts of the little patient to ward off a spasm are often quite distressing to watch. This stage may last for about a month and gradually the paroxysms may become less frequent and not so severe and finally cease, although the cough may persist for a long time after. So long as the child does not show signs of wasting the outlook can be considered favourable.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but the complication to be most feared is broncho-pneumonia.

Treatment.—During the catarrhal period the patient should be kept in bed, but once the whoop has started it is better for the child to be up. The bedroom should be warm but well ventilated and the child's clothing should be warm but not too heavy. It is a wise precaution to protect the child's chest with a little jacket of flannel or gamgee tissue, and the chest should be rubbed night and morning with camphorated oil. While coughing, the child should be supported and a vessel should always be kept near at hand for the coughed-up phlegm. The diet should be light, and it is always a good plan to feed the child immediately after a spasm of coughing, as there is then more chance of the food being absorbed before another bout of coughing or vomiting occurs. The doctor should be left to decide what medicine the child should have, if any is necessary. A visit to the seaside will often be found beneficial.

WIND.—*See* FLATULENCE.

WOMB, DISPLACEMENTS OF.—The two chief displacements of the womb are prolapse, or falling down of the womb, and the displacement backwards.

Prolapse: In severe cases, the patient can feel the womb protruding through the front passage, but in milder cases there may be only pain and a dragging feeling in the lower part of the abdomen, and extending down the thighs. There is usually a great deal of pain when the bowels move and water may be passed with difficulty. In cases of uncomplicated prolapse, pain should disappear immediately the patient lies down; if this is not so, then the falling womb is only part of her ailment. Treatment consists of rest in bed, returning the womb to its proper place and wearing a pessary to keep it in position. These pessaries have to be worn continuously, only being removed about once in two months to be cleaned. If the patient does not find any relief from the wearing of a pessary, an operation to fix the womb should be carried out. (*See* RETROFLEXION *and* RETROVERSION.)

In backward displacement of the womb, the symptoms are somewhat similar to prolapse, but of a more severe character. The pain may not disappear on lying down, and movement of the bowels is generally very painful. Treatment by means of a pessary may be all that is required, but if no relief is given it may be necessary for the patient to undergo an operation.

WOMB, INFLAMMATION OF.—This condition may be due to injuries to the womb sustained during confinement. The wearing of a badly fitting pessary, or exposure to cold or wet, or over-exercise may be other causes. Gonorrhœa is also a factor in causing inflammation of the womb. In acute cases severe pain is usually felt in the back and lower part of the abdomen, and there may be fever, with nausea and sickness. Usually, however, the trouble is more insidious and the chief symptom is vaginal discharge and prolonged or irregular menstruation, with increasing fatigue. Medical advice must be sought, as treatment will vary according to degree of trouble. Operation may be necessary in some cases.

WOOLSORTER'S DISEASE. — *See* ANTHRAX.

WORMS.—The threadworm is found in most countries and is one of the commonest to be found in humans. They are from a quarter to three-quarters of an inch in length, and look like little bits of white thread. Children are most often infected with them and they can be seen wriggling in the stools. Other signs of worms in children are pains in the stomach, restlessness during sleep, irritation and itching around the opening of the anus. The appetite may be greatly increased or it may remain unaffected. The child should be given a purgative so as to empty the bowel. Injections into the bowel of salt and water should also be carried out; each injection should consist of one pint of water. A santonin powder should be given at night or gentian violet capsules three times a day until the motions are clear.

The round worm, or ascaris lumbricoides, is especially common in warm countries. It looks rather like a reddish earthworm and measures from four to fourteen inches in length. The symptoms are much the same as those caused by threadworms and the treatment should be carried out along the same lines.

Tapeworms usually gain an entrance into man through the eating of imperfectly cooked meat. The symptoms may be diarrhœa or constipation, pains in the stomach, dyspepsia and voracious appetite; on the other hand, no symptoms may be apparent. The patient should starve for about eighteen hours and then male fern or filix-mas one to two drachms emulsified with cinnamon water should be taken. After four or five hours, a good dose of Epsom salts should follow. This treatment should be repeated until the head of the tapeworm is seen in the stools.

WOUNDS.—There are many classes of wounds, but the simplest form of injury is an abrasion in which only the skin is damaged. Iodine is an excellent first-aid dressing for most wounds. Incised wounds are those in which the tissues have been cut by a sharp instrument. Contused and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lacerated wounds are produced by crushing or tearing, or by the bites of animals. Punctured wounds may range from the prick of a needle to the stab of a dagger or a fall against the spike of a paling or similar sharp point.

Healing of Wounds.—If a wound is covered with soil or dust it should be cleansed immediately, as there is great danger of infection from the micro-organism which causes lock-jaw. Nature does her work very quickly at times and the quickest process of healing is that known as healing by first intention. This is possible only when the cut surfaces are close together and there is no sepsis. The wound becomes a little inflamed and there is a slight sticky discharge which unites the two surfaces together. In healing by second intention, lacerated wounds and ulcers are healed by the formation of small hæmorrhagic masses which gradually change into normal tissue, thus closing up the wound. (*See* HÆMORRHAGE.)

WRITER'S CRAMP. — *See* OCCUPATIONAL CRAMP.

WRY-NECK.—Wry-neck is a condition in which the head is drawn down towards the shoulder on one side whilst the chin is turned towards the other shoulder. This condition may be present at birth owing to malformation of the muscles of the neck, or it may develop later in life owing to spasm of the neck muscles. Paralytic wry-neck, or stiff neck, may be due to exposure to cold. Hot fomentations should be applied to the neck and galvanic electrical treatment is sometimes very satisfactory. Spasmodic wry-neck usually occurs in middle-aged persons and is due to nervous debility. Some cases may be quite serious. Electrical treatment and massage are often beneficial, but it is sometimes necessary for the medical attendant to operate upon the patient.

X-RAYS.—*See* ELECTRICAL TREATMENT.

YAWS.—This is a tropical disease, not unlike syphilis in character. It also goes under the names of "bubas," "frambœsia" and many other native names. It is caused by a spirochæte very like that which causes syphilis. The germ is not always conveyed through the medium of sexual intercourse, but may be conveyed through fly or insect bites. The germ requires some broken skin whereby to enter, but the slightest little crack may be sufficient for it to do its dire work. The disease, unlike syphilis, is not hereditary, but the symptoms of the two infections are much about the same, and treatment with salvarsan and its substitutes may be found to be efficacious.

YELLOW FEVER.—This fever was also known as yellow jack and is transmitted through the bite of the mosquito. The disease has a very restricted area along the Mexican coast and in some parts of the United States; it is sometimes carried to ports in Great Britain and Europe, but it has never gained a foothold in this part of the world. Careful nursing and diet are the chief methods of treatment.

ZINC POISONING.—This may be swallowed in the form of white vitriol. It leaves the lips and throat burning and painful and no emetic must be given. The patient should be given quantities of milk or strong tea, or the white of an egg, and the doctor should be sent for without delay.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE POPULAR LAWYER

Legal Problems of Everyday Affairs solved in a way that is easy to understand

The following brief summary contains information which may satisfy the inquirer who seeks to obtain sufficient knowledge of the main principles of law applicable to his everyday affairs. It is not intended to guide those who may, unfortunately, find themselves involved in legal difficulties where their interests are vitally involved. In such circumstances, the wisest course is to seek professional advice.

So far as possible the use of technical terms and phrases has been avoided in the hope that the subjects discussed may be made plain to the layman. To attempt such a task is not easy, for the vast body of English law is drawn not only from many statutes and regulations, but also from tens of thousands of judicial decisions which make up the English common law.

Under a separate heading there appears a brief outline of Scots law, which differs materially from the law of England. This distinction is particularly evident in regard to the law affecting domestic relations, marriage, divorce, children and succession to property.

The items covered are as follows, in this order:—Contracts and Agreements, Contracts for the Sale of Goods, Auctions, Guarantees, Bills of Sale, Principal and Agent, Carriage of Passengers, Carriage of Goods, Sales of Land and Mortgages, Landlord and Tenant, Rent Control, Housing, War Pensions, Reinstatement in Civil Employment, Marriage, Husband and Wife, Divorce and Judicial Separation, Alimony and Maintenance, Children, Negligence, Trespass, Insurance, Libel and Slander, The Civil and Criminal Courts, Wills and Intestacy, Gaming and Wagering. Scots Law:—Sales of Land, Feus and Feu-Duties, Contract, Leases, Marriage, Husband and Wife, Aliment or Maintenance, Divorce and Judicial Separation, Parent and Child, Wills and Intestacy, Scottish Courts of Law.

CONTRACTS AND AGREEMENTS

IN his great work on the Laws of England, Lord Halsbury defines a contract as "an agreement made between two or more persons which is intended to be enforceable at law, and is constituted by the acceptance of one party of an offer made to him by the other party to do or abstain from doing some act. The offer and acceptance may either be express or inferred by implication from the conduct of the parties."

A more popular definition is that "a contract is an agreement which the law will enforce." In order to decide whether a transaction is or is not a valid legal contract, it is essential to discover whether the parties intended it as such and whether there was a *consensus ad idem*, that is, that both parties agreed to the same thing.

For instance, if A agrees to buy goods from B, and A thinks the price to be paid is £10 whereas B believes it to be £12, there is no consensus and consequently no binding contract. It is not every agreement which creates a legal contract, nor is every person free in law to make a contract. Obviously an agreement to commit a crime can never be a valid contract, nor can an immoral agreement, nor one that is against public policy, or in restraint of trade.

An instance of an immoral contract is the lease of a house for improper purposes, or an agreement for illicit cohabitation, and examples of contracts void because against public policy include agreements to suppress a prosecution, to procure a marriage for reward, or those leading to any abuse of legal process. All contracts and agreements by way of gaming and wagering are illegal. Some Acts of Parliament specifically forbid the making of certain kinds of contracts, a prohibition which is generally expressed by the phrase that there can be no "contracting out" of the statute. A notable statute of this kind is the Workmen's Compensation Act, 1925.

CONDITIONS FOR A CONTRACT.—The courts will not enforce a moral obligation, nor will a bare promise, oral or written, constitute an enforceable contract. An exception to the rule is the case of a promise made by deed, as explained below. In all other cases there must be benefit

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

conferred. Any act of A from which B derives or expects to derive a benefit, however slight, or any inconvenience or labour sustained by A on B's behalf, is sufficient to enable A to sue in the courts. That is to say, it amounts in law to a valuable *consideration*: it proves that the transaction is not one-sided, but an agreement between two parties by which one of them has gained, or expects to gain, some benefit for fulfilling his obligation to the other.

The commonest consideration is the transfer of money for goods or work done, but any task undertaken on behalf of another, or in fact anything done (providing it is not illegal) at another's request on the faith of a promise amounts to a good consideration. He who claims to enforce a contract must show that he has furnished consideration: that he has done, or forborne to do, some act. Further, it must be real consideration, something of value, not something fantastic or vague.

A consideration already received, a past consideration as it is called, is, generally speaking, insufficient evidence to support a contract. Thus, if a man without promise of reward confers a benefit on another, a promise to pay for the benefit made subsequently does not give rise to a contract, unless the benefit had been given at the request of the man who later agreed to pay for it. Sometimes an action is done under a sense of moral obligation, and possibly by so doing a person renders great service to another, but this is not consideration. When a man does what he is obliged to do by contract with the promisee there is no consideration for a fresh contract.

If a ship is undermanned and the crew perform extra work, it has been held that a promise by the captain to pay higher wages is not given for any consideration, since this is an ordinary risk, incidental to a sailor's life. If, however, the undermanning is so serious that there is an added risk of life, a promise to pay higher wages is given in return for a peril not in the contract and is a good consideration.

A contract of record is a memorial of some legal proceedings which has been enrolled at the proper offices. Under this head is included the recognizance under which a prisoner is bound over to come up for judgment if called upon.

CONTRACTS UNDER SEAL.—A contract under seal (sometimes called a specialty contract) is one which is put into writing and is "signed, sealed and delivered." It is then termed a deed. If only one party promises to do anything it may be signed by him alone, but if both parties are bound, it is executed by both. The ceremony consists of placing the finger upon the seal and saying the words: "I deliver this as my act and deed." A promise made under seal is called a covenant.

Many common transactions are by statute required to be made by deed, among others being the following: (1) any conveyance of land or leases of more than three years; (2) assignments and surrenders of leases; and (3) certain contracts made by local authorities or limited companies.

A contract under seal is said to import agreement, for it is assumed that the party who executes it consents to the deed, but it derives the effect of legality from the formality of the document which is made use of to show the agreement. Therefore, unlike a simple contract, which is valid because it is an agreement based on good consideration, a contract under seal does not require consideration.

A gratuitous promise, if made by deed, is binding. Persons who retire from the service of an employer on the promise of a pension cannot enforce their rights as a rule unless the agreement to pay a pension is made by deed. In practice, however, it is true to say that most deeds, e.g. for the sale of land or leases, relate to some transaction which contains consideration. A contract under seal can be rescinded by a written or parol contract made subsequently for valuable consideration.

SIMPLE CONTRACTS.—The commonest form of contract is what is known as the Simple Contract, which may be either (1) made by word of mouth; or (2) inferred from the conduct or acts or letters of the parties; or (3) put into writing and signed but not sealed and delivered as a deed; or (4) partly in writing and partly in words.

Sometimes it is possible for two complete strangers to contract. An advertisement was inserted in a newspaper offering a reward of £100 to any person who suffered from influenza after using a certain remedy. A woman used the remedy as directed and afterwards fell ill with influenza.

Her subsequent action against the company for the reward was successful. The court held that she had fulfilled the conditions and therefore accepted the offer of the defendants.

Certain contracts must be made in writing, in accordance with the Statute of Frauds, passed in the reign of Charles II. which provides:

No action shall be brought whereby to charge any executor or administrator upon any special promise to answer damages out of his own estate; or to charge the defendant upon any special promise to answer for the debt, default

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

or miscarriage of another person; or to charge any person upon any agreement made in a consideration of marriage; or upon any contract for the sale or disposition of land or any interest in land; or upon any agreement that is not to be performed within the space of one year from the making thereof; unless the agreement upon which such action shall be brought or some memorandum or note thereof shall be in writing and signed by the party to be charged therewith or some other person thereunto by him lawfully authorized.

No special form of wording is required. The court will construe a contract from a series of letters if it be clear that the correspondence contains an offer and acceptance and, without ambiguity, shows who are the parties to the contract. It is a rule of law that parol evidence cannot be given to contradict or vary the terms of a written contract, but such evidence may be tendered to show that the memorandum does not contain the actual terms agreed upon by the parties or to prove that alterations were made with the defendant's consent after signature.

Building contracts have certain peculiarities. It is often stipulated that payment shall be made on certificates given by the architect, who is the agent of the building owner, and until this certificate is given the builder cannot sue for his money. Where such certificates are fraudulently or collusively withheld, the court will give the builder relief. Where the original plan is varied the contract must be followed as far as possible, and work outside it must be paid for as extras. If, however, a builder puts in extra work or materials without obtaining consent from the architect or building owner, or without—if the contract so stipulates—obtaining a written order, the owner is not bound to pay.

By statute law the following contracts must be in writing: transfers of ships or any shares therein, contracts of insurance, the assignment of copyright, bills of sale, and negotiable instruments (i.e. bills of exchange and promissory notes), and contracts for the sale of land.

CONTRACTS BY POST.—If it is contemplated by the parties that the post may be used for communicating acceptance of the offeror's proposal, the contract is complete as soon as a properly addressed letter containing the acceptance is posted. The person making the offer is bound by the acceptance, though the letter be lost or delayed. The court has held that for the purpose of receiving the acceptance, the Post Office acts as agent for the offeror. Proof of posting is required. A letter revoking an offer, however, does not become effective until its actual receipt.

Where a firm offered goods at a certain price "they receiving an answer in the course of the post" it was decided that as soon as the offer was accepted a binding contract arose, and therefore the firm was not at liberty to withdraw the offer before the time expired for the arrival of letters.

Customs and usages of a particular trade or place will be applied to contracts by the courts, though the written document be silent on the point, unless the parties have by express stipulation agreed that such customs and usages be ignored.

DISCHARGE OF CONTRACTS.—A contract is discharged by (a) performance by the promisor of all that he undertook to do; (b) by breach where the promisor fails to carry out his promise; (c) by agreement or by the making of a new contract which terminates the obligations under that already existing (called novation); or (d) by operation of law.

Performance may be defined in the agreement in regard to manner, place and time; and failure in any respect may constitute a breach. Unless the time is specified the general rule is that the undertaker must perform his promise within a reasonable time having regard to the circumstances of a particular case. In building contracts and contracts for the sale of machinery, a period for the execution of the work is usually stated and a clause inserted for money penalties to be paid by the undertaker if he fails to keep within the time.

Breach of contract gives rise to various remedies. The most common course is to bring an action for damages, and unless the sum to be paid in the event of such breach is stated in the agreement, the measure of damage is the pecuniary difference between the plaintiff's position had the contract been duly executed and the position which arises in consequence of the breach.

If damages are inadequate to remedy the wrong caused by the breach, the court may order specific performance of the contract. Specific performance will not be ordered where it involves personal services, for the defendant might stultify the order of the court by doing the work badly.

The difference between the remedy of a money payment, usually spoken of as liquidated damages for breach, and specific performance may be illustrated by a case where a person contracted to take a lease for a fixed term, and to pull down the house on the site and erect a new one. He failed to carry out his agreement, and the court ordered specific performance in regard to the lease and awarded damages

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to the lessor because the house had not been built.

RESTRAINT OF LABOUR OR TRADE.—Contracts of personal service often contain a stipulation that a person shall work for an employer and shall not afterwards enter the services of a rival. The court will not order specific performance of the positive part of such stipulation, and the negative part will be carefully examined and enforced only if it is fair and reasonable. A dentist who engaged an assistant on a contract forbidding him to work subsequently for a rival within a fifty-mile radius was not allowed to enforce this stipulation, but an agreement between a solicitor and his managing clerk whereby the latter undertook not to practise as a solicitor in future within a seven-mile radius of his employer's office was held not to be void as against the public interest. The employer, the court found, was only protecting himself, which was perfectly lawful.

So it is common, when a business is sold, for the purchaser to insist on a covenant being inserted in the purchase agreement restraining the vendor from carrying on the same trade in the vicinity. This, though strictly speaking it is in restraint of trade, is permissible providing the covenant is drawn to protect the purchaser and does not injure the public.

It has been decided that the sale of the goodwill of a business without an express covenant to restrain the freedom of the vendor after the sale, does not prevent the vendor from restarting business in the same district.

The test to be applied to all covenants in restraint of trade is whether or not they are so drafted as to protect the interests of the party concerned without unduly interfering with the interests of the public. A combination of shipowners formed an association to keep up rates of freight and by their joint action in offering rebates, succeeded in preventing a competitor who had not joined the association from obtaining business. A suit against the association for conspiracy to injure the competitor failed. The House of Lords held that the association had acted merely in their own trade interests and not out of malice towards their competitor.

VOID AND VOIDABLE CONTRACTS.—Instances have been given of contracts which being contrary to law or morality are not enforceable. A contract may also be void because no rights or obligations are imposed by it on either of the parties; when, in fact, neither of them can sue the other in respect of it. A contract is *voidable* where one party may treat it as void, although it is valid until he is minded to do so. This situation may arise because one of the contracting parties, through infancy or lunacy, is not able to contract, or where the contract was obtained through gross misrepresentation by one party.

MISREPRESENTATION.—A contract made under some actual or threatened duress, such as personal violence or imprisonment, or violence to the party's wife or child or parent, is voidable. If money be paid under such circumstances it can be recovered by an action. Similarly an attempt to influence a person unduly gives him a right to bring an action to set aside the contract.

Although misrepresentation is a ground for avoiding a contract, the person victimized may prefer to affirm it instead. To establish a claim for fraud a plaintiff must prove that a material misrepresentation was made which the defendant knew to be false, that it was intended that the plaintiff should act upon it, that in fact he did act upon it, and that he suffered loss in consequence.

The misrepresentation may not be only by words or documents; it may be inferred from the defendant's conduct; and it must have been made knowing it to be false or recklessly not caring whether it was true or false. Mere non-disclosure is not enough unless there is a duty to make a full disclosure in particular cases, as in contracts of insurance. Some active misstatement or the withholding or concealment of fact is sufficient. Apart altogether from fraud, an innocent mis-statement or withholding of information may sometimes be enough to allow a person to succeed in an action for the recession of a contract.

In contracts of insurance the utmost good faith is required, and even an innocent concealment of a fact—for example, that the insured person has suffered from a certain disease or that his parents died from some hereditary complaint—may be good grounds for permitting the insurance company to avoid the contract. So also in fire insurance the presence of some added risk, as, for example, an indoor garage, not disclosed by the party insured, may vitiate the contract.

Great care is required in regard to the sale of land, for, if a man be induced to enter into a contract of sale owing to some material misdescription, the contract is avoided. Omission to state with accuracy in a company prospectus every fact within the directors' knowledge, will give a person who has subscribed for shares in that company a valid claim to have his money returned to him.

Because contracts induced by misrepresentation are *voidable* and not *void*, the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

person deceived cannot avoid the contract if he has in any way affirmed it, or if a third party has acquired rights under it, or if the other party cannot be restored to his original position.

MISTAKE.—Frequently disputes arise because a mistake has been made, and then the question arises whether the validity of the contract is affected. Where it is clear that both parties have made a mistake, it follows that there has never been a real contract.

There is one curious case reported where a man and woman, believing themselves to be husband and wife, entered into a deed of separation, which was enforceable as a contract. The parties were not married and the court held that this mutual mistake rendered the deed void. It is not always easy to decide, where one party only has made a mistake, whether any contract exists, but as in most disputes the evidence when properly examined is usually conclusive.

A person who had been convicted of a disgraceful offence applied for the lease of a cafe, using a false name and concealing the fact of her conviction. She was granted the lease, but when the landlord became informed of the true circumstances he asked the court to say that there had never been an agreement because the mistake made the lease void at the start. The court found in his favour. A different result occurred in a case where the buyer of a horse sued because the animal which he believed to be sound in wind and limb was unsound. The buyer could not prove that the seller had made any representation about the horse and so the court held that the buyer's mistake did not affect the contract.

Usually a person who signs a document is presumed to be aware of its purport, but when an old and short-sighted man endorsed a bill of exchange under the belief that he was signing a guarantee, the court held that he was not liable. Money paid under a mistake of fact is always recoverable; money paid under a mistake of law is not. No man can profit by his own mistake. If A buys a necklace from B believing it to be made of real diamonds whereas the diamonds are paste, that is his own mistake, and he cannot be heard to say that the contract should be avoided. It would be otherwise, however, if B knew that A was making a mistake and still went on with the transaction for his own gain. In that case the contract could be avoided because of misrepresentation.

CONTRACTS OF INFANTS.—A person under twenty-one can enter into certain kinds of contracts, although he has not the full capacity of an adult in this respect. Thus, he can contract for his own employment if it is to his advantage or for his own education and also for necessaries which include food and clothes, but not luxuries like motor cars, cameras and so on.

Should the matter be brought to trial the person who has supplied goods to an infant must prove that they are necessaries and that he has charged a reasonable price. If before attaining his majority—i.e. on his twenty-first birthday—an infant enters into a partnership contract, or signs a lease, or acquires shares in a company, he can, before he is twenty-one or within a reasonable time thereafter, repudiate the contract.

Contracts with infants, whether by specialty or simple contract, for the repayment of money lent or to be lent, or for goods (other than necessaries), are absolutely void by the provisions of the Infants' Relief Act. Even if the infant makes a contract, and afterwards on reaching twenty-one ratifies it, no action can be maintained to charge him with the payment of any debt incurred while under age. Contracts with lunatics or with a drunkard whose condition at the time was such as to prevent him from understanding what he was doing are voidable if the lunacy or drunkenness was known to the other party at the time of the contract. Lunatics and drunkards must pay a reasonable price for necessities.

STAMPING. — All written contracts must be stamped with a sixpenny stamp, unless by statute they are specifically charged with other stamp duties (like conveyances of land, leases, bills of exchange and so on). The sixpenny stamp need not be impressed; an adhesive stamp is sufficient, but it is advisable to cancel the stamp by writing the date across it. The stamp may be affixed at any time, and if the contract be contained in a series of documents, it may be placed on any document.

Unless a contract which is required by law to be stamped is so stamped, the courts will ignore it, but it may be received in evidence, if it is a document that may be stamped after execution, providing the unpaid duty and any statutory penalty is paid. By statute the following agreements are exempt from stamp duty; any agreement the matter whereof is not of £5 value; any agreement made for the hire of any labourer, artificer or menial servant; agreements relating to the sale of goods or merchandise, or any agreement between a master and mariners relating to wages in respect of voyages taking place between ports in the United Kingdom.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ENFORCING A CONTRACT. — Only those who are parties to a contract can enforce it, but any of them may be replaced by others. The promisor cannot assign his liability except by making a fresh contract. If the contract is not of a personal nature he may cause it to be performed by another person, subject to this, that his personal liability remains if the substitute performs the contract improperly.

An error as to the person with whom a contract is made annuls it when personal considerations enter into the contract, but not when the party who seeks to repudiate it would have been equally willing to contract with any other person. If A enters into a contract with B to borrow money, not knowing that B is really C, a notorious moneylender, who is trading under the assumed name of B, the contract will be rescinded if it be shown that A would not, if aware of the true facts, have borrowed money from B.

Where the personal element enters into the matter, for example in an agreement to paint a picture, the contract is not usually assignable. In regard to the promisee there is not the same difficulty and he, standing in the position of a creditor, may assign his contract rights without the consent of the promisor or debtor. But he may have to bear any loss arising out of the assignment.

A dyer who handed the clothes of a customer to a subcontractor was held liable for their loss. It was contended that the dyer was exempt from liability because on accepting the order he handed the customer a leaflet on which was printed: "Whilst every care is exercised in cleaning and dyeing garments, all orders are accepted at owner's risk entirely and we are unable to hold ourselves responsible for damage, shrinkage or defects developed in necessary handling. The proprietor's liability for loss is limited to ten times the cost of cleaning." The court held that the dyer must pay his customer the full value of the clothes, because the clause on the ticket limiting his liability only applied where he kept the goods under his own control and not when he engaged a subcontractor. If, however, the dyer had informed the customer that he reserved the right to give the work to a subcontractor, then the clause on the ticket would apply even while the subcontractor had the goods. A different answer was given by the court in another similar case where a customer sued a laundry for lost articles. There the limitation clause printed in the laundry book stated that the maximum amount a customer could recover for lost articles was twenty times the laundry charge. No evidence was given to show how the goods were lost and it was held that failing proof of negligence by the laundry company the clause applied to limit their liability.

A contract right can be assigned, by the person in the position to enforce it, by a notice in writing signed by the assignor addressed to the other party, who owes the obligation. All legal remedies pass on the assignment and the assignee is able to sue in his own name. There are a few exceptions to this rule, notably in the case of officers and men of His Majesty's Forces, whose deferred pay is not assignable. The contracting party under a liability cannot shed that liability save with the consent of the other party. It is possible by an agreement between the parties concerned to conclude an unassignable contract.

The assignment of a debt which passes all the legal rights and remedies and empowers the assignee to give a receipt for the debt, must be in writing, signed by the assignor, and must be absolute (i.e. transfer all the assignor's rights), and notice in writing must be given to the debtor from whom the creditor was entitled to recover the debt.

Even a claim for damages for breach of contract can be assigned; so also may a debt not yet accrued due. A person who has acquired rights in this way, for instance by the purchase of book debts, obtains the legal title to claim the money and can enforce it by action.

LIMITATION ACT, 1939.—Under the provisions of the Limitation Act, 1939, (1) an action based on a simple contract is barred unless brought within six years after the cause of action arises; (2) an action on a contract under seal is barred unless brought within twelve years; and (3) an action to enforce a recognizance or judgment is barred unless brought within twelve years. It should be observed that the times run not from the day on which the agreement was made but from the day on which the cause of action arose, namely, the day on which one party committed a breach of contract.

Acknowledgments in writing or payment in part of a debt would take the case out of the statute.

DEATH OF PARTIES.—The death of either party does not necessarily dissolve a contract. All rights and benefits and liabilities pass to the executors or personal representatives of the deceased, who therefore stand in his shoes and can sue or be sued, as the case may be, under the agreement. Where, however, personal skill enters into the contract death ends the agreement. Obviously, if a novelist

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

entered into an agreement to write a book it would be absurd, if he dies before completing it, to expect his executor to do so.

Bankruptcy of a party to a contract does not render it void. Nor is a bankrupt debarred from making a contract, but if he obtains credit (e.g. by ordering goods) over the value of £10, he must first declare himself a bankrupt. Failure to do so is an offence punishable by imprisonment.

CONTRACTS FOR THE SALE OF GOODS

ALL contracts for the sale of goods are governed by the Sale of Goods Act, 1893, which enacts that a contract for the sale of goods of more than £10 in value is not enforceable unless (1) the buyer accepts part of the goods and actually receives them; or (2) gives something in earnest (e.g. a deposit); or (3) some note or memorandum in writing is drawn up and signed by the party to be charged or by his authorized agent. The contract for the sale of goods transfers the property in the goods from the seller to the buyer for a money consideration (the price), and it may be made subject to any conditions the parties care to stipulate.

In this connection it is well to observe that there is an important distinction between a condition and a warranty. A condition is a stipulation which, if broken by A, allows B to treat the contract as repudiated and reject the goods. A warranty is a stipulation which, if broken, gives B a right to bring an action for damages, but not a right to reject the goods and treat the contract as repudiated. When any question arises, therefore, out of the terms of a contract, it is essential to decide whether the term is a condition or warranty, which will depend on the construction to be placed on the words used.

CONDITIONS OF SALE.—The Sale of Goods Act implies certain conditions in all contracts; namely, that the seller has a right to sell the goods, and that goods sold by sample or description correspond with such sample or description; and certain warranties, namely, that the goods are free from any charges in favour of another person not declared by the seller. There is no implied warranty that the goods shall be fit for a particular purpose, unless the buyer makes known to the seller the purpose for which the goods are required, and the goods are such as the seller normally sells. There is, even then, no such implied warranty if the goods are bought under their patent name.

Goods are "accepted" within the meaning of the statute when the buyer does any act in regard to them which is consistent with the existence of a pre-existing contract of sale.

SELLER'S LIEN.—It is often important to know whether or not possession has passed to the buyer. An unpaid seller can by law keep possession until payment or tender of the price, if no stipulation has been made as to credit, or if the term of credit arranged has expired, or if the buyer has become insolvent; and even if the seller holds as bailee, that is to say, if the buyer has accepted the goods but allowed them to remain on the seller's premises, the seller can still exercise these rights. This right, or seller's lien as it is called, is lost (1) if goods are handed to a carrier to be sent to the buyer without the reserving of the right of disposal; or (2) when the buyer lawfully obtains possession of the goods; or (3) by the seller himself waiving the right. If goods are in possession of a carrier on the way to the buyer, the seller may stop them, either by taking them into his physical possession again or by giving notice to the carrier or other person in actual possession of the goods. A contract for specific goods is rendered void if the goods perish before the risk passes to the buyer, or perish without the seller's knowledge before the agreement is made.

Price is a matter for agreement, and if it is not definitely fixed but left to be determined at some future date, possibly because of the fluctuations in the market price of the material to be used, the buyer must pay a reasonable price according to the facts of each particular case.

SALE OR RETURN.—When goods are sold by sample and description, the contract means that the whole of the goods must correspond. Nowadays it is usual for business transactions to be carried out by post, articles being dispatched to the buyer "on sale or return." This is not a real contract of sale until the buyer notifies his desire to purchase or does some act from which it may be inferred. When the goods are returned in a reasonable time, the transaction is finished and the seller cannot sue for the price. Delay in returning the goods changes the conditional sale into an absolute contract, and the seller can sue for the cost of goods sold and delivered. The whole matter in case of dispute may turn on the question of time. A reasonable time is allowed, and what is to be considered as reasonable depends on the facts of each particular case.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Certain markets and shops, notably those in the city of London, have granted to them a privilege of open market, or market overt as it is called, for the sale of the kind of goods usually dealt with, but not for other kinds of goods. A jeweller's shop, for example, is market overt for jewellery only, and not for precious books, and it is only market overt for sales by the jeweller, not for sales to him.

Goods bought in market overt in good faith, and without any notice of a defect in the seller's title thereto, pass to the buyer under a good title, but the Sale of Goods Act provides that if the goods have been stolen, the title reverts to the original owner when the thief is prosecuted to conviction. If the goods have been obtained by fraud, the title of a buyer in market overt may be good if the owner who has been defrauded really intended to part with the goods, even though he was induced to do so by fraud.

In regard to the sale of goods (or for that matter to the sale of land), there is one maxim which the purchaser must never forget, *caveat emptor* (let the buyer take care), because in view of what appears above, if he takes no guarantee from the seller as to his title or as to the quality or suitability of the article supplied, the loss will fall in most cases on the buyer.

AUCTIONS

AN auctioneer is the agent of the vendor for whom he sells, and the agent of the purchaser for the purpose of signing a memorandum of the contract. Thus, if a person makes a bid and the bid is accepted, the auctioneer may himself sign a contract sufficient to satisfy the provisions of the Sale of Goods Act, or a memorandum in writing to satisfy the provisions of the Law of Property Act, as to sales of land if the purchaser afterwards refuses to sign it himself.

This implied authority to act as agent must be exercised at the time of sale. It is personal to the auctioneer and cannot be exercised by his clerk.

As between the vendor and the auctioneer it may be said that the latter's implied authority (i.e. apart from any express agreement) is to sell the goods or land in the manner customary amongst auctioneers. If a reserve price is placed upon the subject of the sale by the vendor, and the auctioneer sells without reserve, a sale below the reserve price does not give the purchaser a right to enforce the contract against the vendor.

PAYMENT OF DEPOSIT.—Deposits must be paid to the auctioneer in cash, but he may be given authority by the vendor to receive payment by cheque. He has no authority, unless it is specially granted to him by the vendor, to give a warranty in respect of anything he may sell, and if he does so warrant goods may himself be liable to an action by the purchaser for breach of warranty. Once an article is knocked down the auctioneer's authority ends. He must then see that the article is handed to the buyer and that the purchase price is paid.

The authority to auction may be withdrawn by the vendor at any time before the property is knocked down, and if the auctioneer proceed with the sale after such notification of withdrawal, he cannot give a title to the bidders, and he will also render himself liable to the vendor for damages in trespass.

A sale by auction is complete as soon as the auctioneer signifies so by the fall of his hammer. Until that indication is given a bidder is at liberty to retract his bid.

A seller cannot bid unless the auction is notified to be subject to a right for him to do so. At any sale where the seller himself, or through an agent, bids contrary to this rule, the buyer may treat the sale as a contravention of the conditions of sale and fraudulent, providing the auctioneer has knowingly taken such bid. It is advisable for a seller who wishes to guard against his property being disposed of at a low price, to reserve expressly for himself or his agent the right to bid.

CONDITIONS OF AUCTION.—If the conditions of an auction are advertised and a buyer complies with them, any violation of such conditions gives the buyer the right to recover damages against the vendor. It must be stated by the vendor whether the sale is without reserve or with a reserve price, or whether the right to bid is reserved.

It is a statutory offence for any dealer to give or offer to give any inducement to any person to abstain from bidding at an auction sale, or for any person to accept an inducement for so abstaining. As the holder of the deposit on the purchase price, the auctioneer is in the position of a stakeholder. He must pay it to the vendor if the contract is completed, or return it to the purchaser in the event of the contract being abandoned, or, alternatively, of the failure of the vendor to carry it out.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

GUARANTEES

A CONTRACT of guarantee arises when one person promises to answer for the debt, default, or miscarriage (i.e. any wrongful act for the consequences of which civil liability arises in law) of another person. Three persons are necessary to create such a contract; the surety or guarantor, who generally has no direct interest, the creditor and the debtor. The contract must be in writing.

Primarily the debtor is liable for the debt; the surety is only a conditional debtor, and the creditor cannot look to him for payment unless the debtor defaults. Thus, if A and B go into the shop of C where A makes a purchase, the contract of suretyship or guarantee will arise if B says to C: "If you supply these goods to A on credit and he does not pay you, I will pay you," and if B also signs a memorandum in writing to that effect.

This transaction must be distinguished from another form of transaction which at first sight appears similar, but is in law widely different. If B says to C: "Let A have the goods he orders and debit them to my account," or "Let him have the goods and I will see you paid," such words do not give rise to a contract of guarantee. They create a contract of purchase by B, who is solely liable for the debt, and do not impose any liability upon A.

Sometimes confusion arises in connection with the contracts of suretyship and indemnity. As already explained, the former is a promise to pay the debt of another on his default, and so is often referred to as a "collateral" or conditional contract; the latter is a contract to keep a person who has entered, or is about to enter into a contract, indemnified whether any third person makes default or not. A contract of fire insurance, for example, is a contract of indemnity, and so is the contract made by an agent who sells another's goods on commission and undertakes to be responsible for the payment by the person to whom he sells them.

WHAT IS NEEDED FOR A GUARANTEE.—Guarantees are like other contracts and there must be present the following essential elements to make them valid: Mutual consent, the capacity to contract, and consideration (unless made under seal). Until the guarantor signifies his acceptance no contract exists. The consideration often does not benefit the surety. It may be a mere undertaking by the creditor not to sue the debtor. Under the provisions of the Statute of Frauds, no action can be brought upon any special promise to answer for the debt, default, or miscarriage of another, unless the agreement upon which the action is brought is in writing by the person to be charged or his authorized agent. A verbal guarantee cannot be enforced (unless it be given by a solicitor over whom the court may enforce it, because it has summary jurisdiction over him as an officer of the court).

Any representation as to the credit, trade, or dealings of another person, in order that he may obtain credit, is valueless if given verbally, but if given in writing and if it can be shown that the person who gave it knew it to be untrue, and wrote it with the intention of inducing another to act upon it, an action may be brought upon it for damages. Although the consideration does not appear in writing in the guarantee, an action may be brought, for parol evidence may be given of the consideration.

No special form of words is required in the written memorandum, so long as the agreement between the parties is shown, and the party to be charged has added his signature. Indeed, it is possible that the guarantee may be contained in several documents written on different days—as a series of letters. If not under seal a six-penny stamp is required for guarantee; but if it is under seal then the duty is ten shillings.

RIGHTS OF THE GUARANTOR.—A guarantee may be limited in time or may be a continuing guarantee applying to a number of transactions. Liability does not arise until the debtor defaults. If the surety does not pay he can be sued immediately; if he pays he becomes entitled to all the rights possessed by, or securities held by, the creditor in regard to the debt, default, or miscarriage of the debtor, and can, if he wishes, bring an action at once, and can also claim for any damage sustained beyond the principal and interest paid to the creditor.

Payment by the debtor discharges the surety from his obligation. A material alteration in the terms of contract between the creditor and debtor will also discharge the guarantee. Thus, if A becomes surety for B in respect of the building of a house according to a plan by C, and B and C afterwards alter their contract by greatly enlarging the house, A is thereby relieved of his obligation as surety. Where a person stands guarantee for the honesty of a servant, he will be discharged if the master detects the servant in a dishonest act, but in spite of so doing still continues to employ him.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

If the debtor dies before the default arises, the surety is discharged from liability, but the death of the surety is not in itself sufficient to end the guarantee, and it is necessary for his personal representatives to give notice of death. Such notice revokes the guarantee, but if there is liability in regard to previous transactions this will fall against the surety's estate. Guarantees are assignable, and assignees can take every remedy which was open to the assignor.

BILLS OF SALE

A BILL of sale is an instrument in writing by which one person transfers to another the property he has in goods and chattels, or a document used in regard to the transfer of goods where it is not intended to give possession. An absolute bill of sale passes the property in the goods upon the execution of the deed; a conditional bill of sale passes the property but the goods themselves remain in possession of the person who made the bill.

The person who makes a bill of sale is called the grantor and the person in whose favour it is made is called the grantee. A bill of sale may be given for (1) articles transferable by delivery; (2) growing crops charged separately from the land; (3) fixtures charged separately from the land; and (4) trade machinery. The security must be accurately described, and if many articles are included an inventory is necessary.

Any person able to contract, i.e. not being an infant under twenty-one or under a disability, can make a bill of sale for goods of which he is the true owner. A married woman can give a valid bill without her husband's concurrence to bind goods forming part of her separate estate. Where a husband and wife gave a bill of sale for goods which belonged to the wife and not to the husband, the court held that the bill was void.

MINIMUM AMOUNT OF ADVANCE.—There must be a real advance or consideration which must be stated and must amount to £30 or over. It is not necessary that an absolute bill of sale should comply with the statutory form in the Bills of Sale (Amendment) Act, 1882, but when the bill of sale is given to secure a money payment by the grantor, it must be made in the form provided, must be signed by the grantor and properly attested.

There must be included a clause to the effect that the goods comprised in the bill shall not be seized or taken possession of by the grantee, unless (1) the grantor defaults in paying the money due or in performing other conditions contained in the bill and necessary for maintaining the security; or (2) the grantor becomes bankrupt or suffers the goods to be distrained for rent, rates, or taxes; or (3) the grantor fraudulently removes the goods or any part of them from the premises in which they were when the bill was made; or (4) the grantor refuses to produce his last receipts for rents, rates, or taxes when so requested in writing by the grantee to do so; or (5) execution has been levied on the goods following a judgment at law.

If the grantee seizes the goods for any of the above reasons, he must not remove them from the premises for five days, during which the grantor may apply to the court, which, if satisfied because the money has been repaid, or for any other reason, that the cause of the seizure no longer exists, may prevent the grantee from selling the goods or make such order as seems just.

An absolute bill of sale must be attested by a solicitor, and the attestation must state that before execution, the effect of the bill has been explained to the grantor by the attesting solicitor. Conditional bills of sale must be attested by one or more credible witnesses, not being themselves parties to it.

REGISTRATION.—All bills of sale must be registered at the Bills of Sale Department of the Central Office at the Royal Courts of Justice, Strand, London, within seven clear days after the making thereof (if the time expires on a Sunday or other day on which the registrar's office is closed, the registration is valid if made on the first opening day afterwards). Before being registered it must be stamped with the proper amount due, calculated according to the consideration.

It is essential that the bill of sale should accurately describe the parties and the attesting witnesses, and care is required that the description of occupation and residence shall be that at the time of registration. Mis-descriptions may be so material as to invalidate the bill of sale. Registration must be renewed every five years.

A bill of sale by way of security for the payment of money is void: (1) if it is not duly attested; or (2) if it is not registered; or (3) if the consideration is not set forth truly; or (4) if it is not in accordance with the statutory form; or (5) if made for less than £30; or (6) if it is a successive bill

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of sale, that is, if it is executed within seven days after the execution of a prior unregistered bill of sale and given for the whole or part of the same debt, and comprises the whole or part of the same goods.

It does not follow that a bill of sale which is void is altogether a valueless document. Money lent under a void bill of sale may still be recoverable as money had and received. So also, if chattels comprised in the bill of sale are not specifically described in the schedule or inventory, or if the grantor is not the true owner, the bill of sale may be void in respect of such goods; except as against the grantor. Though the bill of sale be void the grantor may sometimes in his own interests treat it as valid. In such circumstances he cannot afterwards say it is void.

BANKRUPTCY OF GRANTOR.—If a grantor becomes bankrupt the grantee can prove his debt as a creditor, in which case he must surrender the bill of sale to the trustee in bankruptcy who stands in his place, or he may sell the bill of sale to the trustee. A bill of sale is no protection in respect of personal chattels comprised within it which are liable to distress under a warrant for taxes and rates or for distress for rent.

Where several bills of sale are given which comprise wholly or partly the same goods, they have priority according to the date of registration. A transfer or assignment of a registered bill of sale need not be registered. The transferee of the bill of sale stands in the same position as the person who transferred it.

PRINCIPAL AND AGENT

AGENT.—An agent is a person who acts on behalf of another person called a principal. Those incapable of contracting themselves, i.e. persons under twenty-one, cannot act through an agent, but they may act as agents. The great maxims of the law of agency are that "a person who acts through an agent acts for himself" and that "an agent cannot delegate his power to a sub-agent."

In law a clear distinction is drawn between general and particular agents. A general agent is one who has authority to perform all duties relating to a particular business, e.g. the manager of a branch shop; and a particular agent is one who is authorized to perform a special duty, e.g. selling a house. The principal is not bound by the act of a general or a particular agent if the agent exceeds his authority, but as the mandate given to a general agent is wider, the court interprets all acts within the general scope of his authority as binding on the principal. Thus, if the manager of a shop ordered goods normally dealt with by his principal, the latter would be liable even though he might have expressly instructed the manager not to buy such goods.

An agency of necessity arises where a person who has been given charge of another's property does something necessary to preserve the property in an emergency. It also arises where a wife, living separate from her husband, finds herself without means and pledges his credit for necessaries (which includes food, clothing or medical attention).

If a person adopts the contract made by another who at the time of making had no authority to act, it is regarded as a ratification. Unless the person making the agreement purports to be acting as an agent at the time, and the contract is one within the capacity of the principal, there can be no ratification and the contract is regarded as the contract of the person who made it. Every agent employed to make purchases must fulfil his duty with diligence, care and discretion, and must obey his principal's instructions. If a shopkeeper instructs an agent to buy for him goods of a certain class and the agent buys goods of a different class, the shopkeeper may sue the agent as for a breach of contract for damages.

BRIBES AND SECRET COMMISSIONS.—The strictest probity is required of an agent with regard to his accounts, which must be delivered to the principal on request, for it is illegal for an agent to make profits in connexion with the agency unknown to the principal. Bribes, secret discounts, or commissions paid to an agent can be recovered by the principal. Thus, a police officer, who was shown to have received moneys for showing favour to certain individuals, was compelled to pay over the moneys received to the Crown, whose agent he was.

By the Prevention of Corruption Act, 1906, an agent who corrupts any person or receives or attempts to obtain any gift or reward for showing or forbearing to show any favour or disfavour to any person in relation to his principal's business, or knowingly with intent to deceive makes use of any account or document in which the principal is interested and in which there is a false or misleading statement, is guilty of an offence punishable on conviction before a jury by a fine of £500, or two

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

years' imprisonment, or by both fine and imprisonment.

REMUNERATION OF AGENT.—An agent is entitled to remuneration which is founded on contract, not necessarily a written contract, but one which may be inferred from the circumstances. If a solicitor or accountant is engaged to do certain work, a presumption arises that the person employing him will pay the usual fees. It matters not whether the principal is benefited or not by the agent's services; but any wilful breach of duty or misconduct or negligence resulting in loss to the principal, may prevent the agent from recovering. Agents who act without authority are personally liable for any claims which may arise in consequence.

Sometimes several agents are asked to do the same work, for example, where a person wishing to sell a house places it with various estate agents. In such cases only the agent through whose efforts the house is sold is entitled to commission on the purchase price, unless the others have by special request advertised the property or rendered other services, when they become entitled to some reward *quantum valeat*, that is, to as great a reward as the service is worth.

An estate agent has not authority to enter a binding contract of sale for property for which he has been asked to procure a purchaser. If he procures a tenant he must, before letting the property, make inquiries as to the tenant's solvency and respectability, or he may be responsible in damages to the owner.

CARRIAGE OF PASSENGERS

ANY person who carries passengers for hire or even without charge by land, sea, or air, is a carrier, but there are two main classes of carrier known to the law—the *common* carrier and the *private* carrier—and varying liabilities and duties attach to each. The distinction between the two is that the common carrier cannot refuse to carry any person, not being an objectionable person, who is prepared to pay the published fare, providing there is accommodation. Railway, steamship and omnibus companies and proprietors of taxi-cabs and ferrymen are common carriers, but a person who lets his car on hire with his own servant as the driver is not. Any person who has the right to decide whether he will carry a particular passenger is a private carrier.

Although all the great transport concerns now carry on their undertakings under statutory powers which govern routes, fares and a multitude of other matters, it should be pointed out that their liabilities and duties in law rest, so far as the passenger is concerned, on the common law.

Common carriers are not insurers of passengers. They do not warrant that their trains or vehicles or ships are safe, nor do they undertake the personal safety of passengers. That does not mean that they are immune from all responsibilities, but simply that they are liable only in cases where their own servants have been negligent. In practice this duty to avoid negligence and to take due and reasonable care is strictly enforced, and for even a slight breach of his duty the common carrier may have to pay heavy damages. Thus in the case of vehicles or in the running of the service there can be no question of liability if negligence be brought home to the authority or its servants, though different considerations may apply if an accident arises through a passenger's own negligence.

Those who board moving trains or take other risks obviously have no claim. Unforeseen accidents are not covered. Thus, where the evidence showed that an accident was due to a latent defect in a wheel tyre which could not have been discovered on examination, a railway company was held blameless.

CONDITIONS ON TICKETS. — In order to succeed in a claim for damages against a common carrier, the passenger must show that he was lawfully in the vehicle, i.e. that he had paid his fare or had permission from the authority to travel. This last condition applies in the case of children under three travelling with an adult, who are permitted to travel free. A traveller over three years old without a ticket travels at his own risk; a trespasser on a railway station who falls down an unlighted staircase is the author of his own wrong and cannot make the authority liable. Nor can a passenger succeed if by a prior contract he has barred his own claim.

Tickets are issued subject to conditions, printed sometimes on handbills or notices or on the ticket, and the traveller is bound by those conditions even though he cannot read. A person who took an excursion ticket which bore on the back a condition to the effect that the company was not under any liability to the holder for injury "however caused," lost his claim for damages although it was proved that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

he had not in fact asked for an excursion ticket and could not read. The issue of a ticket creates a contract between the carrier and the ticket holder which is enforceable only against the parties. Accordingly, where the holder of a workman's ticket was killed in a railway accident and his widow sued the company, it was held that she could not recover damages above £100, the sum expressed on the back of the ticket to be the limit of damages payable by the company to the ticket holder.

The ticket is the property of the railway authority and must be shown on demand and surrendered at the end of the journey. If the passenger fails to produce the ticket he is bound to pay his fare on the spot or to give his name and address. It is an offence to travel without a ticket with the intention of avoiding payment of the fare, or to sell a ticket or to refuse to give one's name and address.

Damages have been awarded to passengers against railway and steamship companies because of their failure to transport them to their destination. Hotel expenses or the cost of another method of conveyance can be properly included, and are likely to be allowed, in the claim for damages.

CARRIAGE OF GOODS

A COMMON carrier of goods means a person who undertakes the carriage of goods for reward, usually at a fixed rate of charge. He must carry goods without distinction of persons, providing he has room, and that the person offering the goods is ready to pay reasonably for them. He is an insurer of the goods during transit and until delivery, and unless a special contract be made, must make good all losses except those caused by (1) an act of God, or (2) an act of the King's enemies, or (3) inherent defects or vice in the goods carried, or (4) bad packing.

The meaning of the words "act of God," according to cases decided by the courts, is expressed in the following proposition: "A common carrier is not liable for an accident as to which he can show that it is due to natural causes directly or exclusively, without human intervention, and that it would not have been prevented by any amount of foresight and pains and care reasonably to be expected from him." This includes storms, floods and the like, but not fire. "The King's enemies" is a phrase used to cover the risks of war or rebellion, not the depredations of thieves or rioters.

The loss of fruit or other perishable goods or of animals which struggle in transit and injure themselves is included in the words "inherent defects or vice." But where the nature of perishable goods is known to the carrier and there is an unreasonable delay which results in the destruction of the goods, an action lies against the carrier for delay. When dangerous goods are sent to a carrier warning must be given, otherwise he is entitled to recover damages for any loss incurred.

LIABILITY OF COMMON CARRIER. —Generally speaking, a carrier who collects goods from places of business for transport by rail or by ship is called a common carrier. Railway companies are common carriers, but a furniture remover is not.

Because a common carrier is compelled to carry goods he is given a lien on them until his charges are paid. Thus a common carrier who carried stolen goods delivered to him by a thief was held to be justified in detaining them until his charges were paid. By parting with the possession of the goods the carrier loses his lien. If a carrier warehouse goods during transit his liability may continue, but this will depend on the circumstances, for if it be shown that in so doing he is acting as a warehouseman, he may escape liability since a warehouseman is only compelled to take the same care of goods under his charge as a prudent man would take of his own goods, and is responsible only for acts due to his negligence.

No common carrier by land is liable for the loss of or injury to the undermentioned goods contained in any parcel or package, when the value exceeds £10 unless, on delivery to the carrier, the consignor declares their value and pays or agrees to pay an increased charge.

> Gold or silver coin or manufactured or unmanufactured gold, precious stones, jewellery, watches clocks, trinkets, bills, banknotes, orders, notes or securities for the payment of money, English or foreign stamps, maps, writings, title deeds, paintings, engravings, pictures, gold or silver plate or plated articles, glass, china, silks, furs, lace.

If the common carrier be the railway authority, the amount is £25 instead of £10, and silks are deleted from the list of goods given above.

PASSENGERS' LUGGAGE. — The railways are common carriers of passengers' luggage (though they are not insurers of luggage which at a passenger's request is put in the compartment in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which he travels), and they are common carriers by water if they undertake transport by sea. If the authority's servants are negligent, they may be liable for luggage taken into a compartment. A person whose bag fell into the sea during unloading was awarded damages. If a railway servant takes charge of a passenger's luggage while acting within the scope of his authority and it is lost, the authority is responsible. Passengers' luggage does not include merchandise or pictures. If such articles are carried they must be declared.

A private carrier does not profess to carry goods for everyone, but only for those who contract with him for a particular service. He must take such care as a prudent man would take of his own goods, but he is not an insurer, and in case of loss is responsible only where it can be shown that either he or his servant has been negligent. Contracts can be made by carriers exempting them from liability for their servants' negligence. Indeed, the contract may be so widely drawn that the carrier is not liable for negligence however caused or however gross, and therefore it is necessary for the sender of goods, in order to protect himself, to examine with care the contract of carriage.

SALES OF LAND AND MORTGAGES

THE King owns all land according to English law and his subjects hold from him as tenants. In feudal times grants were made of land to be held in return for certain services rendered to the King. The furnishing of soldiers or the payment of rent were the most common services, but these tenants in chief, as they were called, were allowed to make grants of the whole or part to other persons for some return in the form of rent or service.

Despite the many changes throughout the centuries the old phrases still survive, and a person who now holds land free from all charges or services is said to have an estate (or interest) in fee simple. He has an absolute power to sell the land during his lifetime or to grant a lease for a term of years or to devise it at his death.

Although the group of statutes passed in 1925 (The Law of Property Act, Settled Land Act, Trustee Act, Land Registration Act, Land Charges Act, and Administration of Estates Act) swept away former complicated statutes with regard to land, it cannot be said that the present law is easy to understand.

FREEHOLD.—The new law came into force on January 1, 1926, but it was provided that rights acquired before that date should not be affected, and therefore it is necessary to consider shortly the old and new law. Since 1926 only two forms of legal estates in land are recognized, the fee simple or freehold, and the estate for a term of years or leasehold. Formerly there was another kind of land tenure known as copyhold, under which the freehold was vested in a person known as the Lord of the Manor. A tenant held in theory from him; and the title deeds to the land consisted of a copy of the rolls or register which were kept by him or his steward. Certain services were due to the Lord of the Manor by the tenants. Since 1926, land held by copyhold has become freehold land.

The freehold tenant is entitled not only to enjoy the surface of the land but also the buildings upon it and the minerals beneath it, although in practice one often finds that surface, buildings and mineral rights belong to three separate persons.

Freehold is often spoken of as real estate, because in former times when a man sued for his right to an estate in fee simple, he was said to be party to a real action, that is, he was claiming a *res* or thing. On the other hand, a lease was, and still is, spoken of as a personal interest in land, because a party in seeking to establish his rights under a lease does not claim the *res* but only his personal right to exercise dominion over it according to some agreement.

There was also a difference with regard to the descent of freehold and leasehold land if the owner died without making a will. The former passed to a person known as his heir (usually his eldest son), and the latter to his personal representative to be distributed according to the Statute of Distributions. Now there is no difference, as the rules of intestate succession have been made the same for land as for other forms of property.

DEEDS OF CONVEYANCE.—A conveyance of land or of any interest therein is void for the purpose of transferring or creating a legal estate unless made by deed. The deed must be stamped with an *ad valorem* duty. Before the conveyance is executed, however, a contract of sale is usually drawn up by the seller to be signed by the buyer. It sets out and must describe accurately what the seller is offering for sale, what his title is (usually with a clause prohibiting the buyer from inquiring further into this unless he makes his requisition or inquiry within a stated

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

time), the price to be paid, and when possession is to be given.

A deposit of 10 per cent of the price is paid by the buyer either to the vendor or to a stakeholder, which is returnable if for any reason the transaction is not carried out. Frequently the contract of sale provides that this deposit be forfeited wholly or in part if the buyer be responsible for the failure to carry out the deal.

After the contract of sale is signed, the vendor must send to the buyer a document called an abstract of title, which contains a history of the land and must show a title going back 30 years. Before 1926 a title of 40 years was required. If in perusing the abstract the buyer is not satisfied with the title he must address a list of requisitions to the vendor, who is bound to answer them. After these questions are answered to the buyer's satisfaction the conveyance is prepared in draft and approved by both sides. A day is fixed for the completion of the transaction, when the balance of the purchase money is handed over and the buyer receives the conveyance which constitutes his title to the land.

REGISTRATION OF LAND.—In an attempt to simplify this complicated transaction, which requires the employment of a solicitor, a system known as the registration of land has been introduced, and it is claimed that when this is fully known and developed it will be possible for the ordinary man to buy his house with little more formality than he buys any other possession.

In order to register land it is necessary to show a good title to the Land Registry (situate at Lincoln's Inn Fields, London, W.C., to which address inquiries should be sent). After all the documents have been investigated by the officials, and certain fees paid, the land is entered in the register. After this has been done a land certificate is issued which constitutes the title and can be handed over to future buyers.

On a sale the certificate must be handed over to the buyer, who takes it to the Registry with a document called the transfer form duly stamped and signed by the vendor to show that the land has changed ownership. A fresh entry is then made in the register and another certificate issued. If money is borrowed on registered land on mortgage or any other charge over the land is made, this must be registered.

The benefit of the system is that it permits an intending buyer, by paying a small fee for inspecting the registers, to find out exactly what he is buying. Any charge over land which comes within the provisions of the Land Charges Act and is not registered is void against the buyer, and therefore it is easy to see at a glance whether land is encumbered or not.

SPECIFIC PERFORMANCE. — Once the contract of sale is signed, the buyer becomes what is known as "equitable" owner and is bound to pay the purchase money. In legal phraseology it is said that the contract against him will be enforced by specific performance. If he buys a house and the house be destroyed between the time of purchase and the time for completion, the loss falls upon him. It follows that benefits accruing to the estate, as, for instance, the discovery of minerals, during the same period, belong to him. It is, therefore, wise for any person on signing the contract of sale to make provision at once to insure his property, for he cannot claim any benefit under a policy in the name of the vendor.

Contracts for the sale of land are enforced by specific performance, because it is evident that if a man agrees to buy a particular house or plot of land, the vendor who refuses to carry out the contract is not in a position to compensate him for a breach of contract by merely offering money compensation.

MORTGAGES.—When land is assigned in return for a sum of money on the understanding that it shall be re-assigned on repayment of the loan it is said to be mortgaged. The person who borrows the money and pledges his land as security is the mortgagor and the lender is the mortgagee.

A mortgage is usually made by deed, and that is generally referred to as a legal mortgage in contradistinction to an equitable mortgage, which is a contract creating a charge over the land without passing any legal estate into the hands of the lender. When a man borrows money and leaves his deeds of title to land with the lender without executing any deed, he makes an equitable mortgage.

The terms "legal" and "equitable" in this respect are employed to indicate a technical distinction in the manner of carrying out the mortgage transaction. In both cases the court will, if necessary, enforce the rights of mortgagor and mortgagee under either form, though a person holding a legal mortgage is in a far more advantageous position than an equitable mortgagee.

Before 1926 a mortgage of freehold land was carried out by a deed which conveyed the estate to the mortgagee, and gave the mortgagor the right to redeem his property on repaying the full account of the loan and interest. This right to redeem was known as the equity of redemption, and only the court could extinguish it and declare the mortgagee to be the absolute

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

owner of the estate, but before this could happen the mortgagor must have been in arrears with his payments of interest, or in default with capital payments if the mortgage were to end at a fixed date.

Under the Law of Property Act, 1925, a legal mortgage of freehold land is now made by a lease for a term of years, usually 3,000, with a proviso that the term shall cease if the money lent is repaid. This is an advantage to the mortgagor inasmuch as he retains the legal estate and has not merely an equity of redemption.

If it is desired to raise a second mortgage, the deed drawn up provides that the second mortgagee shall take a lease for 3,000 years and one day subject to a proviso for cesser on redemption. This is because the first mortgagee already holds the land for 3,000 years and, therefore, the mortgagor can grant as security for the further loan only his reversion.

MORTGAGE OF LEASEHOLDS.—Leasehold mortgages before 1926 were sometimes made by assigning the whole term of the lease, but more often by a sub-lease for a few days less than the term, because a sub-lease gave protection and at the same time prevented the mortgagee from being charged to execute the covenants made with the original lessor.

Since 1925 a mortgage of leasehold land is effected by way of an underlease for a term of one or two days shorter than the term granted in the lease, with a provision that, on payment of the mortgage money on the appointed day, the mortgagee shall surrender his underlease. The mortgagee is not liable on the mortgagor's covenants under the original lease.

Mortgages made before 1926 are now subject to the provisions of the Law of Property Act, and therefore the effect of deeds executed prior to 1926 is that the mortgagee holds the land for a term of 3,000 years from January 1, 1926, subject to a proviso for cesser on redemption.

REMEDIES OF MORTGAGEE.—In case of default in the payment of principal or interest, the mortgagee can take any of the following courses: (1) Call in the loan on the day fixed for repayment, and if there is default, sue the mortgagor personally on the covenant to repay the amount contained in the mortgage deed; (2) enter into possession and pay himself what is due from the profits of the land; (3) appoint a receiver to administer the estate (this remedy is available only when the capital money is due); (4) sell the land, providing the mortgagor has not complied with a notice to repay the money in three months, or is two months in arrears with the interest, or has broken some covenant in the deed other than the covenant to pay back the loan and interest; (5) obtain from the court a foreclosure order which vests the estate in the mortgagee free from any right on the mortgagor to redeem. Such orders are not made until after a period (usually six months) in order to give the mortgagor a chance to repay the debt.

While in possession of an estate a mortgagee can grant leases, including building leases for 99 years, which are valid against the mortgagor, and may also sell trees on the land which are ripe for cutting, but not ornamental trees.

The mortgagor may redeem the mortgage at any time, a proviso being generally inserted in the deed that he shall give three or six months notice of his intention so to do. If so minded the mortgagor may pay six months' interest in advance in lieu of notice.

Second or third mortgages, or, indeed, any person who has a legal or equitable interest in the land, or who has obtained a lien over it, may insist on redeeming a first mortgage and on receipt of the full amount of the debt, interest and costs, the first mortgagee must pass over his interest in the land.

At one time the release of the mortgagor on repayment of the loan was made by a separate deed. This is now unnecessary and a receipt on the mortgage deed operates as a surrender of the mortgagee's term. There is no such thing as an irredeemable mortgage, and so any restriction or "clog" on the rights of the mortgagor to redeem his mortgaged property is bad in law.

A firm of brewers lent money on mortgage to the licensee of a public house, making it a covenant of the mortgage that he should not sell in the house any liquors except those supplied by them. The court held this to be a void covenant because it was a clog on the mortgagor's right to redeem and ordered that the mortgagee must reconvey the property free of such covenant.

SALE OF MORTGAGED LAND.—Land may be sold subject to a mortgage but in this case it is the usual practice for a mortgagor to repay the loan. A fresh deed can then be drawn up charging the assignee. Upon making the loan, the mortgagee is not allowed to make a contract to buy the mortgaged property, but he may, by a separate transaction after the mortgage has been made, agree to take an option to buy it.

Actions arising out of mortgages are limited to twelve years; that is to say, if the mortgagee is in possession, the mortgagor or anyone claiming through him must bring his suit within twelve years

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

after the last receipt; and the mortgagee, suing for money secured on mortgage, must do so within twelve years from the date some part of the principal or interest has been paid, or some acknowledgment given in writing.

On the death of a mortgagee his interest, unless specially bequeathed, passes to his personal representative, who stands in his place and has the same rights to repayment. If the mortgagor dies, the right to redeem or reversion under the deed passes to his personal representative.

When mortgaged land is bequeathed, the devisee normally takes it subject to the mortgage, although a special direction may be given in the will that he should take it freed from the debt.

LEASES

ANY estate of land for a fixed term or for a term limited to end on some fixed date is a leasehold interest. It matters not how long the term may be, 1 year, 99 years, or 999 years, so long as the term can be fixed. In other words, the lessor (or landlord) never parts with the whole of his interest, and at some future time he or his successors will again obtain possession, whereas the lessee (or tenant), or his assignee, must surrender their right when the end of the fixed term is reached.

But while the tenancy lasts the lessee has exclusive possession against all the world, even though it may be restricted in certain ways. It is not to be confused with a licence. Thus if a man hires a concert hall for two days, he is clearly not a tenant because there is no intention by the owner to part with possession.

There are five kinds of leasehold interest known to the law:

1. A tenancy on sufferance arises when a tenant for a fixed term remains in possession after his lease has expired. A tenant on sufferance can be ejected by the landlord at any moment. When a person remains in possession without the landlord's consent, holding over, as it is called, he is liable to pay double rent.

2. A tenancy at will is created when either landlord or tenant can determine the tenancy at any moment upon giving notice, but it is necessary for the landlord to give notice to quit before he brings an action for ejectment. A tenancy at will or on sufferance is not assignable.

3. A yearly tenancy arises when land or a house is granted to the tenant "from year to year." Notice to quit is required to end this tenancy, one year's notice in the case of agricultural land, half a year's notice in regard to other leases. Strictly speaking, as the tenancy is from year to year it continues, if not determined at the end of the first year, for another year unless notice, expiring at the end of the year, has been given. In actual practice the parties usually agree that six months' notice may be given at any time to determine the tenancy, instead of notice expiring at the end of some particular year.

Sometimes a yearly tenancy arises by implication of law. A tenant on sufferance who pays rent regularly, though his actual lease has expired, creates a tenancy from year to year upon the terms in the lease so far as they apply, and unless there has been any express stipulation to the contrary.

4. Monthly or weekly tenancies are tenancies which are determinable by notice to quit expiring on the same day of the month or week as they began.

5. Leases for a fixed term of years can be made for any length of time, three years, or three thousand years, or longer as the parties agree.

IMPLIED COVENANTS.—In all leases the Law of Property Act, 1925, provides that certain covenants or conditions shall apply whether they be actually written in the lease or not. These are called implied covenants to distinguish them from any particular covenants to which the parties may agree.

By the implied covenants the lessor or landlord agrees that the lessee or tenant shall have quiet enjoyment of the land free from encumbrances, and that the lease is valid. In regard to this last covenant, it should be pointed out that a leaseholder is not allowed to investigate the lessor's title, unlike a purchaser of freehold, who is allowed to inquire into the title of the vendor.

When a lease is assigned, that is when a person purchases from a lessee all his rights under the lease, it is necessary for the lessee to hand over the original lease and all subsequent assignments, and to satisfy the purchaser, by handing over to him the last receipt, that rent due under the lease has been paid. Successors in title are bound by the covenants, and therefore a person buying a leasehold should inquire carefully what are his liabilities. Thus anyone buying a 99 years' lease which has only 10 or 15 years to run may well find himself saddled with heavy expenses for repairs when the lease expires.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A sub-lessee can never find himself in such difficulties because he does not take over the whole term. If the lease has 20 years to run, an assignment of 20 years, less one day only, is sufficient to protect him, as the person holding the reversion of one day will be responsible to the lessor.

The principal covenant entered into by the lessee is to pay rent. Breach of this covenant gives the lessor a right to distrain; that is, to enter upon the premises and seize sufficient property belonging to the lessee to satisfy the amount due.

The lessor or any person who is entitled to receive the rent may enter and distrain on the land if rent be 21 days overdue. If it be 40 days overdue he can enter into possession and hold the house or land until the arrears are paid, or if he wishes he can grant leases to raise the amount of the debt. [If the house is within the Rent Restrictions Acts (*see* RENT CONTROL INFRA) the landlord has no right to distrain without the leave of the court.]

WHAT MAY BE DISTRAINED.—All goods found on the premises are distrainable, but protection is given to the property of lodgers, under-tenants and third parties, who can, by making a declaration, protect from distress any property belonging to them which may be upon the premises.

If a tender be made of all arrears a distress cannot be made legally, and a landlord who distrains after such tender is liable in damages. Even where goods have been impounded or taken in distress and legal tender be made within five days of the rent and costs, the landlord must accept it.

Wearing apparel and bedding, tools of trade to the extent of £5, perishable commodities, and money, unless it can be identified by being in a bag, are exempt from distress. Impounded goods cannot be sold until five days after they have been taken, and any money received above the amount necessary to satisfy the distress must be handed over to the tenant.

If he wishes, a landlord may by arrangement with the tenant leave impounded goods on the premises. A tenant dealing with such goods is guilty of pound breach and liable in damages. It should also be observed that even if the premises be destroyed by fire or become uninhabitable from want of repair, a tenant who has covenanted to pay rent is still bound to do so. After such event, therefore, the tenant should give notice to quit immediately.

RIGHT TO ENFORCE COVENANTS.—Besides agreeing to pay rent the tenant usually binds himself to execute repairs, not to assign or underlet the premises without the licence of the lessor, not to alter the premises, not to remove certain fixtures, not to carry on certain trades and (sometimes) not to take in lodgers. Breach of these covenants may result in forfeiture or give the lessor the right to re-enter, but the lessor, before taking any step to enforce his covenant either by action in the courts or otherwise, must serve a notice on the lessee, specifying the particular breach complained of and, if such breach is capable of remedy, calling upon the lessee to remedy it, and in any event to pay reasonable compensation for the breach.

If the lessee fails to remedy the breach within a reasonable time and pay compensation, the lessor may bring the matter before the court, which may then enforce the lease or grant relief to the lessee on such terms regarding damages, compensation and costs as it thinks desirable.

In such an action an under-lessee may apply to the court, which may vest the lease or part of it in him on the conditions of paying such rent, compensation and costs as the court may order. The lessor cannot succeed in enforcing a right of re-entry or forfeiture for breach of a covenant to repair unless he proves that notice calling upon the tenant to effect repairs and pay compensation has been served, and that the fact of such service is known to the lessee or under-lessee or the person who last paid the rent as agent for either of them.

SUBLETTING AND REPAIRS. — A condition in a lease that a tenant shall not assign or underlet without the lessor's consent is subject to the condition that such consent shall not be withheld unreasonably. Thus if a man holds at £100 a year on a long lease and then finds himself unable to continue in occupation, he can, if he is unable to obtain a subtenant at £100, sublet at some less figure; for it has been held that a lessor who refused consent to a lessee to do this because it would diminish the lessor's own chances of letting similar neighbouring property at £100 was acting unreasonably.

A covenant to repair, unless it be expressly so agreed, does not make the lessee responsible for keeping the premises in the same condition as they were when taken over, or of putting them in such condition at the end of the lease. It is enough if the premises are put into such a state of repair as renders them reasonably fit for the occupation of a reasonably minded man, the age of the building, its character and the locality being all considered.

Even if a lessee agrees to leave the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

premises in the same state as at the time of making the lease, ordinary and natural decay resulting from the passage of time does not constitute a breach of covenant. A lessor, unless he agrees to repair the premises, is not bound to do so, nor (except in houses let at £40 a year or less in London or £26 elsewhere) does he undertake that the house or flat is fit for human habitation.

FURNISHED HOMES.—In agreements for leasing furnished houses or rooms, there is implied a condition that the premises are reasonably fit for habitation, but this is not a continuing condition. It applies only at the beginning of the lease and the landlord is not bound to execute repairs. Thus it has been held that if the lessee of a furnished house finds that it is infested with bugs, or that the former tenant suffered from pulmonary tuberculosis, he is entitled to repudiate his contract of tenancy, but if after he has entered into possession the plaster of the ceiling falls into the room, he is not.

There are certain other covenants common to leases which may be mentioned, namely, those spoken of as "covenants running with the land." Such covenants bind all successors in title of the original lessee, and are different from personal covenants, for example a covenant to pay rent which is enforceable only against the particular lessee who promised to pay. They may take various forms: to insure the property in a particular fire insurance company, to allow access to the premises for the purpose of draining water, to refrain from placing advertisements on the land or erecting outside wireless aerials, and the like.

Rates are payable by the lessee unless it be otherwise agreed, but if the tenant pays the lessor's property tax or land tax he can deduct it from the rent.

NOTICE TO DETERMINE TENANCY.—If a person holding under a weekly, monthly, or yearly tenancy leaves without giving notice to quit he forfeits a week's, month's, or year's rent as the case may be to the landlord, but if before the expiration of such period the landlord lets the premises to another tenant, the contract is rescinded and the landlord cannot recover.

Notice may be given verbally or in writing, signed by the landlord or his authorized agent, or if given by the tenant, signed by him. It may be served by leaving it at the residence of the person to whom it is addressed or by sending it to him by registered post. If the lease provides for the tenancy to end on a certain day there is no need for either the landlord or the tenant to give notice.

In leases for 21 years which allow the tenant an option to continue or determine his tenancy at the end of the seventh or fourteenth year, it is necessary for a tenant who wishes to surrender the tenancy to give the proper notice.

If, after receiving notice to quit, the tenant remains in possession and no action is taken to make a fresh tenancy, the landlord cannot distrain, but must take the legal remedy of suing for the use and occupation of the premises. If the tenant has himself given notice and remains in occupation he is liable under an old statute to pay double rent.

STAMP DUTIES.—Leases for large or small amounts of rent may be made by words or in writing, providing that they are made for three years or less. Leases for a longer period must be made by deed. A lease is assignable unless an express stipulation has been made to the contrary. It may be surrendered to the landlord at any time, which act, of course, relieves the lessee from all liability under it.

Leases not made by deed are often drawn up in formal legal terms. It is sufficient if the agreement clearly states the names and descriptions of the parties, the date from which it is to operate, the length of time during which the tenancy is to run, a full and proper description of the property to be let, the rent (with the times of payment, and also the powers of the landlord in the event of non-payment), and arrangements arrived at regarding repairs, the tenant's right to sub-let or assign his lease, and the length of notice to quit required.

Stamp duties on leases are as follows:

Lease or tack of any dwelling-house, or part thereof, for term not exceeding a year, at rent not exceeding £40 a year, twopence.

For any definite term less than a year of any furnished house or apartments where the rent for such a term exceeds £25, ten shillings.

Lease or tack of any lands, houses, etc., at a yearly rent:

Exceeding	Not exceeding	Not exceeding 35 years	Between 35 and 100 years	Exceeding 100 years
£	£	£ s. d	£ s. d.	£ s. d.
	5	1 0	12 0	1 4 0
5	10	2 0	1 4 0	2 8 0
10	15	3 0	1 16 0	3 12 0
15	20	4 0	2 8 0	4 16 0
20	25	5 0	3 0 0	6 0 0
25	50	10 0	6 0 0	12 0 0
50	75	15 0	9 0 0	18 0 0
75	100	1 0 0	12 0 0	24 0 0
100	150	3 0 0	18 0 0	36 0 0
For every full sum of £50 or fractional part of £50		1 0 0	6 0 0	12 0 0

Where a lease is granted for a furnished house, it is well that an inventory should be drawn up in writing, signed by both parties, and attached to the lease. Leases take effect from the date fixed for their

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

commencement whether it be the actual day of entry or not.

LEGAL CHARGES. — Unless it is otherwise agreed the practice is for the lessor or his solicitor to draw up the lease at the expense of the lessee. The approximate charges are:

Scale I—Lessor's solicitor. For preparing, settling and completing ordinary leases at rack rent (i.e. a rent which represents the full annual value in whatever way rates, taxes and repairs may be borne as between lessor and lessee), 7½ per cent on leases at a rent up to £100; £2 10s. per cent on every complete £100 between £100 and £500; £1 per cent on each complete £100 over £500; minimum charge, £5. Lessee's solicitor for perusing draft lease and completing: One half the amount payable to the lessor's solicitor.

Scale II—Lessor's solicitor. For conveyances of freehold estate, reserving rent, or building leases reserving rent or other leases for a term of 35 years or more not at rack rent: Where annual rent does not exceed £5, £5; between £5 and £50, the same payment as on a rent of £5 and also 20 per cent on the excess beyond £5; between £50 and £150, the same payment as on a rent of £50, and 10 per cent on the excess beyond £50; over £150, the same payment as on a rent of £150, and 5 per cent on the excess beyond £150. Where a varying rent is payable, the amount of annual rent is to mean the largest amount of annual rent. Lessee's solicitor for perusing draft and completing, one half of the amount payable to the vendor's or lessor's solicitor. Where a solicitor acts for both parties he can charge the lessor's solicitor's charges and one half of the lessee's solicitor's charges. All charges are subject to the increase granted by Statutory Rules and Orders, usually about 50 per cent.

RENT RESTRICTIONS ACTS, 1920 TO 1939

INTRODUCED in 1915 when building operations had ceased owing to the First World War, the Rent Restrictions Acts have been continued long after the time originally intended. That is to say, they were designed as emergency legislation to end on a stated day, but building operations have never caught up with the demand for houses, and successive Acts have been necessary to prolong the life of the Increase of Rent and Mortgage Interest (Restrictions) Act, 1920, which is known as the Principal Act. There are in all nine Acts still in force and their interdependence on each other makes a complicated body of statute law. In effect they supersede temporarily the ordinary law of landlord and tenant by restraining the right of a landlord to eject his tenants or to raise rents.

Houses may be subject to control because they are either 1920 houses or 1939 houses. The former come within the provisions of the Rent and Mortgage Interest (Restrictions) Act, 1920, and its various amending Acts. The house must be let as a dwelling house and its rateable value on the appointed day, April 6, 1931, if within the administrative county of London, must not have exceeded £35; or elsewhere in England and Wales £20 on April 1, 1931; or in Scotland £35 on May 16, 1931. If on December 6, 1937, part of the house was sub-let and occupied as a separate dwelling, or vacant and let and the rateable value of the whole house on the appointed day after subtracting the rateable value of the sub-let or to let part did not exceed the above figures, the house may still be controlled. This exception applies only if the rateable values on the appointed day did not exceed £45 in London or Scotland or £35 elsewhere.

By the Rent and Mortgage Interest Restrictions Act, 1939, dwelling houses not subject to 1920 Act control are brought under control, if the rateable value on the "appropriate day" exceeded £35 but did not exceed £100 in London, exceeded £35 but did not exceed £90 in Scotland, and exceeded £20 but did not exceed £75 elsewhere. For London the appropriate day was April 6, 1939, elsewhere in England and Wales April 1, 1939, and in Scotland May 16, 1939. Houses previously under the control of the 1920 Act and since decontrolled by the operation of later Acts were again brought under control from September 2, 1939, by the 1939 Act.

WHAT CONTROL MEANS.—Rateable value is ascertained by taking the value shown on the current valuation list, and if the house was assessed on the appointed day as part of a larger hereditament, the County Court can be asked to make an apportionment. "House" for the purpose of the Acts includes part of a house, but there must be a separate letting. A mere agreement to share a house in common by two or more tenants does not create separate protected tenancies.

Control is said to operate *in rem*, which means that the control attaches to the house itself, not to the tenant. But it is well to point out that there is no power to contract out of the statute once a statutory tenancy arises by virtue of the Act. Neither the protected tenant (i.e. the tenant holding under a tenancy agreement protected in respect of rent and security of tenure under the Acts) nor the statutory tenant (i.e. the tenant whose tenancy has been ended by notice to quit or the running out of his contract of tenancy but who keeps possession under the Acts) can lawfully agree not to avail

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

himself of the protection of the Acts if proceedings are brought against him by his landlord. Unless and until an order for possession is made against him or he himself yields up possession, the protection of the Acts remains. A notice by the landlord of his intention to increase the rent brings a contractual tenancy to an end, and so has the effect of making the tenant a statutory tenant.

GROUNDS FOR POSSESSION. — If satisfied that suitable alternative accommodation is available or will be available when the order for possession becomes effective, the court can make a possession order. Alternative accommodation means: (1) a house affording the tenant a like security of tenure; and (2) suitable to his family's needs and proximate to his place of work; and (3) offering similar accommodation at the same rent. "Family" here means the tenant's wife or children or brothers or sisters living with him, but not lodgers.

If the court considers it reasonable to do so, it can make a possession order without proof of suitable alternative accommodation on any of the following grounds:

1. Non-payment of rent or breach of covenant in the tenancy agreement (e.g. sub-letting part of a house for business purposes).
2. Nuisance or annoyance to adjoining occupiers by the tenant or his sub-tenant or any person residing with him or the use of the house for immoral purposes or waste. (The term waste includes wilful damage to the premises or carrying out unauthorized alterations. Waste by a sub-tenant is included.)
3. Where the tenant has given notice to quit and as a result the landlord has agreed to sell or lease the house.
4. Where without the consent of the landlord the tenant has assigned or sub-let the whole house or sub-let part, the remainder being sub-let.
5. Where the house consists of or includes off-licence premises and the tenant has committed a licensing offence or failed to carry on the business satisfactorily.
6. Overcrowding to the danger of the health of the occupants. Evidence of this may be furnished by the fact that the standards laid down in the Housing Act, 1936, as regards the number of persons per room have not been observed.
7. The house is required by the landlord for occupation by a person in his wholetime employment, providing that the contract of employment has been made subject to a house being provided, and also that the tenant obtained the house because he was in the employment of the landlord (or former landlord) and has ceased to be so employed. If the house is wanted for a farm labourer a certificate from the county agricultural committee must be produced to show that the prospective tenant is engaged on work necessary for the proper working of an agricultural holding.
8. The house is reasonably required by the landlord (not being a landlord who has become landlord by purchasing the house or any interest therein after December 6, 1937, in the case of a 1920 house or after September 1, 1939, in the case of a 1939 house) for occupation as a residence for himself or any son or daughter of his over eighteen years of age or his mother or father. An order must not be made on this ground if the court is satisfied that, having regard to all the circumstances of the case, including whether accommodation is available for the landlord or the tenant, greater hardship would be caused by granting the order than by refusing to grant it.

PREMISES OUTSIDE THE ACTS.— The Acts apply only to a house let as a "separate dwelling," and so if the tenant has to share an essential living-room (e.g. the kitchen, but *not* the bathroom or w.c.), it is not let as a separate dwelling, and is not protected by the Acts.

Where a house is *bona fide* let at a rent which includes payment in respect of board, attendance or the use of furniture, the Acts do not apply, but the part of the rent attributable to such charges must be substantial. A small quantity of furniture such as oilcloth or stair carpet or curtains is not sufficient. A tenant who holds an unfurnished tenancy is no longer protected if he sub-lets the premises furnished.

Where a furnished house under 1939 Act control is let at a rent inclusive of payment for the use of furniture, and it is proved to the satisfaction of the County Court on the tenant's application that the rent charged yields or will yield a profit exceeding the normal profit, the court may order the amount payable over the normal profit to be irrecoverable. "Normal profit" means the profit which might reasonably have been expected from a similar letting in the period from September 1, 1938 to September 1, 1939. This provision does not apply as regards the rent charged for a house or any part of a house entered in the local authority's register under the provision of the Furnished Houses (Rent Control) Act, 1946 (see hereafter).

If a 1939 house is let with agricultural land exceeding two acres it is outside the Acts. A tenancy granted by the Crown is not protected by the Acts. Any house or part of a house provided since February 6, 1919, by a local authority is not within the Acts, but those erected before that date may be. It is usual, however, for a local authority to ask for ejectment orders at the County Court as if their houses were subject to control. A parsonage house is not protected, nor is a house which comprises premises licensed for the consumption of intoxicating liquor on the premises. If the rent of the house is less than two-thirds of the rateable value, the Acts do not apply, but they will if there is a further letting at that figure.

STANDARD RENT.—A standard rent attaches to every controlled house. This is the rent at which the house was let on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

August 3, 1914, or the rent at which it was last let before that day, or if not let on that day, the rent at which it was first let in the case of 1920 houses. The standard rent of a 1939 house is the rent at which it was let on September 1, 1939, or where it was not let on that date, the rent at which it was last let before that date, or where it was first let after September 1, the rent at which it was let. "Rent" includes the payments agreed to be made by the tenant, even if some of them are described as payments for various extra amenities supplied by the landlord.

In case of dispute the standard rent has to be found by apportionment. It should be observed that the standard rent means the rent of the particular house. Thus, where a house has been sub-let in two parts it does not follow that the standard rent of the whole house is to be found by adding the rents for the two parts together. The statutory test must be applied to the last letting of the house as a whole.

Although the standard rent binds the landlord, he is permitted to make certain statutory increases of rent, according to the following provisos:

(1) 8 per cent for improvements or structural work if carried out after August 4, 1914, in respect of a 1920 house, or after September 2, 1939, in respect of a 1939 house. (If the work was done before July 2, 1920, however, only 6 per cent is allowable.)

(2) An amount equal to any increase of rates paid by the landlord.

(3) Where the landlord is responsible for repairs to the premises, 40 per cent in regard to 1920 houses.

(4) Certain increases where the tenant sub-lets part of the house (not applicable to 1939 houses).

Before any increase of rent can be made, the landlord must serve a notice to quit, but where a tenant holds over as a statutory tenant, no notice is necessary because the tenancy has already been determined and the tenant remains in the house because the Acts allow him so to do.

The death of a statutory tenant does not of itself end the statutory tenancy. His widow, if she were residing with him at the time of his death, or, where a tenant leaves no widow or is a woman, such members of the tenant's family so residing as may be decided by the County Court, can succeed to the tenancy. "Member of the tenant's family" has been held to include the widower, brother, sister and niece of the whole blood.

Overpayments of rent by a tenant made not earlier than two years from the date of payment can be recovered. If there has been no change of landlord, the tenant is entitled to deduct the excess from the current rent. Distress upon the goods and chattels of a tenant is forbidden without the leave of the court.

OFFENCES. — The following offences are punishable by fines on prosecution before the justices: Failing to supply a true statement of the standard rent on a demand being made in writing. Supplying a rent book not conforming to the regulations. Not entering the name of the medical officer in the rent book. Not entering the current rate in the rent book. Making a false statement that a house is decontrolled (imprisonment may be awarded for this offence). Demanding a premium (often called key-money) for the letting or renewing of letting of a controlled house (£100 fine). Demanding an unreasonable price for furniture as a condition of letting (£100 fine). Charging over the court's figure in respect of a sub-let part of a house.

RENT CONTROL OF FURNISHED HOUSE

UNDER the Furnished Houses (Rent Control) Act, 1946, the Minister of Health can order that the Act shall apply in any area.

Thereupon a rent tribunal is set up to deal with questions arising out of contracts for letting a house or part of a house, which include payment for the use of furniture or for services, but the tribunal has no jurisdiction over contracts within the Rent and Mortgage Interest Restrictions Acts, 1920-1939 (see above).

"Services" includes "attendance, the provision of heating or lighting, the supply of hot water and any other privilege or facility connected with the occupancy, not being a privilege or facility requisite for the purpose of access to cold water supply or sanitary accommodation."

If the lessee pays for board a sum which is a substantial part of the rent the premises are outside the Act.

Either lessee or lessor may refer a contract to the tribunal who, after making such inquiry as they think fit and giving each party an opportunity to be heard, may reduce the rent or dismiss the application. In certain circumstances they may approve a higher rent.

Local authorities must keep a register of rents for the purposes of the Act, showing certain prescribed particulars and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

rent as approved, reduced, or increased by the tribunal. Once an entry of the rent is made in the register it is unlawful (1) to receive or require any sum in excess of such rent; or (2) to make the grant, renewal, or continuance of the contract of letting conditional on the payment of a premium or any sum in addition to the rent. Payments unlawfully made are recoverable.

If, after a contract has been referred to the tribunal by a lessee, a notice to quit is served by the lessor at any time before the decision of the tribunal is given or within three months thereafter, the notice does not take effect before the expiration of the three months, though the tribunal may substitute a shorter period. If a reference is withdrawn the notice expires seven days after the withdrawal.

The tribunal may, by notice in writing, call upon a lessor to supply them with such information about a letting as may be specified in the notice. A certified copy of an entry in the register is evidence of that entry in any proceedings. To receive or require any payment or consideration in contravention of the Act is punishable on summary conviction by £100 fine or six months' imprisonment (or both), and the court may at the same time order the excess money received to be repaid. A fine or imprisonment can also be imposed on lessors who fail without reasonable cause to supply the information which shall be required by the tribunal.

HOUSING

THE Housing Act, 1936, consolidated previous housing acts and enactments relating to housing. For the purposes of the Act county, district or rural councils are made the local authorities responsible for administration outside London. In London the L.C.C. is the local authority for the County Council area and the Common Council for the City.

In any contract for letting a house for human habitation at a rent not exceeding £40 in the administrative county of London or £26 elsewhere, there is implied, notwithstanding any stipulation to the contrary, a condition that the house at the commencement of the tenancy is, and an undertaking that the house will be kept by the landlord during the tenancy, in all respects reasonably fit for human habitation. If the house is let for a term of not less than three years upon the terms that the lessee puts it in a state of reasonable repair, the condition and undertaking do not apply.

On giving 24 hours' notice the landlord or his agent authorized in writing may enter the house to view the state of repair at any reasonable time of the day. "Landlord" here means any person who lets a house, and "house" includes part of a house. Houses occupied by agricultural workers under a contract of employment are within the above provision.

In the case of a house occupied or of the type suitable for occupation by the working classes, the name and address of the district medical officer and of the landlord (or his responsible agent) must be inscribed in the rent book, or where there is no rent book, delivered in writing to the tenant on the beginning of the tenancy.

LOCAL AUTHORITY'S POWERS.—It is the duty of the local authority to inspect their district and to keep a record of houses found unfit for habitation. Bye-laws may be made regulating the number of persons who may occupy a house, drainage, closet accommodation, water supply, accommodation for storing and keeping food, fire precautions, repairs, lighting and the prevention of nuisance. Prosecution and a fine may follow the failure to keep a bye-law. On application the bye-laws may be inspected at the local authority's offices.

On being satisfied that a house suitable for occupation by persons of the working class is in any respect unfit for occupation, the local authority, if they are of opinion that it can be made fit at a reasonable expense, must serve a notice on the person having control of the house, this notice requiring him to execute the necessary work in 21 days. The person having control is he who receives the rack rent (i.e. a rent not less than two-thirds of the full net annual value of the house) either for himself or as agent or trustee of another. If the work is not done in the specified time, or where there is an appeal and the notice has been confirmed within 21 days after the decision on the appeal, the authority may themselves do the work and recover the cost by action or summarily as a civil debt.

Back-to-back houses are deemed unfit for occupation under the Act. Closing orders may be made for the whole house or for a part of a house. Underground rooms where the average height from floor to ceiling is not seven feet, or where there is not the prescribed (i.e. by the bye-laws) ventilation or lighting, are deemed unfit for habitation.

CLOSING ORDERS.—Where it is not

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

possible to effect repairs without reconstructing the premises, the landlord may declare his intention of closing the premises, and thereupon a closing order is deemed to be operative.

If four local government electors complain in writing to the medical officer that any dwelling-house within the district is in a condition so dangerous or injurious to health as to be unfit for habitation, he must inspect it and report to the authority. A closing order may be issued following on the medical officer's report, and notice served upon the person inhabiting the house to vacate it in 14 days. To re-let a closed house is an offence (penalty £20 fine and £5 a day while the offence continues). After a closing order has been operative for three months and an order for work necessary to make it fit for habitation has not been executed, a demolition order may be made.

Insanitary houses unfit for habitation and not capable of being rendered fit, may be demolished after 21 days or other time as may be specified in the demolition notice served on the person having control of the house and, if known, on the mortgagees. If the house is not demolished by the owner, the authority may themselves carry out the work and recover the cost. It is an offence (£20 fine and £5 a day while continuing) to occupy a house after a closing order has been made. Appeal lies to the County Court against closing or demolition orders. The judge has power either to confirm, or quash, or vary an order.

Where a person has appealed against a notice requiring the execution of work, and the judge, in allowing the appeal, finds that a house cannot be rendered fit for habitation at a reasonable expense, the authority may purchase the house by agreement or may on the order of the Minister of Health compulsorily purchase the house, and thereafter execute the work.

Persons displaced by reasons of demolition or closing orders may be granted reasonable expenses for removal or, if carrying on business, allowances for disturbance of trade. The fact that premises involved in an order under the Housing Act are protected premises within the Rent Restrictions Acts does not prevent their displacement.

CLEARANCE AREAS. — Where the local authority are satisfied that dwelling-houses in an area are by reason of disrepair or sanitary defects unfit for human habitation, or are, by reason of their bad arrangements or the narrowness and bad arrangements of the streets, dangerous or injurious to the health of their inhabitants, and that the most satisfactory method of dealing with such conditions is the demolition of buildings in the area, a resolution may be passed declaring the area a clearance area. The authority may either order demolition of the buildings in the area, or purchase the land and themselves perform the demolition. On the same lines, and for the same reasons, a resolution, not so drastic in its effects, may be passed declaring an area an improvement area. This results in demolition of buildings as circumstances require to abate overcrowding in the area. Compensation is payable to land and property owners, to be assessed, in case of dispute, by arbitration. Tenants of working-class houses displaced as a consequence of clearance or improvement orders must be found alternative accommodation. An allowance may be made towards removal expenses.

Persons carrying on any trade or business who are displaced, are entitled to reasonable compensation for loss occasioned by the disturbance, such loss being estimated with regard to the probable length of time the premises might reasonably have been expected to be available for further trade or business, and the availability of other premises suitable for that purpose. Advances to carry out repairs may be made by local authorities in any case where, having regard to the cost of the repairs or to the financial position of the applicant, it is reasonable to do so. Appeal against clearance and improvement orders lies to the Minister of Health.

OVERCROWDING. — It is now an offence (£5 fine and £2 a day while continuing) to cause or permit a house to be overcrowded. A house is deemed to be overcrowded when the number of persons sleeping in the house either (a) is such that any two of those persons, being ten years old or more of opposite sexes and not being persons living together as husband and wife, must sleep in the same room; or (b) in relation to the number and floor area of the rooms of which the house consists, in excess of the permitted number of persons as defined in the Fifth Schedule of the Act. The Fifth Schedule is as follows: The expression "the permitted number of persons" means, in relation to any dwelling-house, either

(a) the number specified in the second column of Table I in relation to a house consisting of the number of rooms of which that house consists, or

(b) the aggregate for all the rooms in the house obtained by reckoning, for each room therein of the floor area specified in the first column of Table II. the number specified in the second column of that table in relation to that area, whichever is the less. Provided that in computing for the purposes of Table I the number of rooms in a house, no regard shall be had to any room having a floor area of less than 50 square feet.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Table I

Where the house consists of

(a) One room	2
(b) Two rooms	3
(c) Three rooms	5
(d) Four rooms	7½
(e) Five rooms or more	10

with an additional 2 in respect of each room in excess of five.

Table II

Where the floor area of a room is

(a) 110 square feet or more	2
(b) 90 square feet or more but less than 110 square feet	1½
(c) 70 square feet or more but less than 90 square feet	1
(d) 50 square feet or more but less than 70 square feet	½
(e) Under 50 square feet	nil

In determining the number of persons sleeping in a house no account is taken of a child under one year old, and a child who is over one year and under ten years old is reckoned as one half of a unit. The Minister has power to modify these requirements to meet exceptional conditions, and a local authority may permit an excess of the statutory number as a temporary measure.

The permitted number must be shown in the rent book, and a certificate of the local authority stating the number and floor areas of rooms, and that such particulars have been ascertained in the prescribed manner, is *prima facie* evidence of the fact. It is the duty of the landlord to inform the authority of overcrowding, and notwithstanding that the tenant may be a protected tenant under the Rent Restrictions Acts, a landlord can obtain possession on proof of overcrowding. Enforcement of the provisions against overcrowding rests on local authorities.

PROVISION OF HOUSES.—It is the duty of local authorities to review periodically housing conditions in their area and to frame proposals for new houses for the working classes. They may (a) erect houses on any land acquired or appropriated by them; (b) convert any building into houses; (c) acquire suitable houses; or (d) alter, enlarge, or repair houses or buildings which have been acquired by them. To supply the needs of their area they can go outside that area. There is power to acquire land by agreement or compulsory purchase, and to lay out streets and open spaces. Special provisions apply to rural districts.

Under the Housing (Temporary Accommodation) Act, 1944, arrangements may be made by the Minister of Health and the Minister of Works for the manufacture of temporary houses, and their erection on land acquired by local authorities under the general powers of acquisition conferred on them by the Housing Act, 1936 (Part IV). These houses, prefabricated of steel or some other material, are provided on agreed terms between the Ministry of Health and the local authority. When permanent houses are erected power is given to the Minister to order the removal of the temporary houses. The Act also empowers an authority to obtain land sites for temporary houses. Open spaces, that is land laid out for public recreation or as a public garden, may be used by an authority for the erection of temporary houses under a special authorization by the Minister of Town and Country Planning.

WAR DISABILITY PENSIONS

EX-SERVICE men or women, Home Guards (who for this purpose are classed as private soldiers), members of the Royal Merchant Navy or National Fire Service who suffer from a disability, caused or aggravated by service, can claim a war pension, and in the event of the death of any person within these categories, the widow, children and other dependants are entitled to a pension if the death was caused or hastened by service. Disability pensions due to service in the First World War, 1914-18, were restricted to the three fighting services and the nursing service, but during the Second World War the scope of the pensions scheme was very widely extended. Changes have also been made to remove some of the handicaps which lay in the path of claimants.

Soldiers, sailors and airmen still constitute the greater proportion of claimants. Their right is based on statute and on the Royal Warrant, and on the equivalent statutory rules and orders relating to the Navy and Royal Air Force which deal with the detailed pensions and gratuities appropriate to rank.

These are for the Navy: S.R. and O. 1944 No. 99, amended by S.R. and O. 1944 No. 1125; for the Army: Royal Warrant for Retired Pay and Pensions 1946, Cmd. 6489; and for the Royal Air Force: House of Commons Paper, 1944, No. 7. They may be bought at H.M. Stationery Office, Kingsway, W.C.2.

Entitlement arises in all three Services on the same grounds. Disablement must be due to a wound, injury or disease which is (1) "attributable to war service, or (2) existed before or arose during war service and has been and remains aggravated

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thereby." In fatal cases the death must be due to or hastened by (1) "a wound injury or disease which was attributable to war service; or (2) the aggravation by war service of a wound injury or disease which existed before or arose during war service." War service means service after September 1, 1939. In no case is there an onus on a claimant to prove the fulfilment of the above conditions, and the benefit of any reasonable doubt must be given to the claimant.

ONUS ON THE MINISTER. — This last provision has led to some misunderstanding. It does not mean that if a man has been passed fit and breaks down or dies in service, a pension is automatically granted (or, as it is sometimes expressed, "fit for service means fit for pension"). No pension can be awarded unless the required conditions are fulfilled, and the Minister of Pensions, in practice, seeks to discharge the onus that lies upon him by producing medical evidence to show that the named disability is not due to or aggravated by war service. Perhaps the commonest example of this is provided by the claims following death from cancer, for it is easy to find medical support for the contention that that fell scourge is not related to military service.

Of course, it does not follow that the Minister is right in his view, and every claimant has a right of appeal on fact to the Pensions Appeal Tribunal. Again the Minister can withhold, cancel or reduce any award or reject a claim altogether in any case in which it is shown that the death, injury or disease was contributed to by serious negligence or misconduct of the soldier, sailor or airman. In practice it must be said that this provision is generously interpreted despite the wide meaning possible in regard to negligence. While a person is actually serving, no pension can be awarded, though it is common enough to assess the percentage of disability at a Ministry of Pensions Medical Board before discharge. As a rule pensions are not awarded permanently save in the case of the loss of a limb or blindness, and are therefore subject to review. In cases where there has been a degree of disability which has passed away, it is usual to award a gratuity to the person affected. All pensions and gratuities are free of income tax.

WIDOWS AND DEPENDANTS.—To be eligible for a pension, a widow must show that she was not separated from her husband at his death unless the separation was caused by his mental instability arising from disablement in war service. If she was entitled to periodical payments from her husband under a maintenance or separation order, and was, during the six months prior to his death, either receiving such payments or taking steps to enforce them, she is eligible. Similarly if her husband throughout such period was contributing to her support during their separation.

Also, an unmarried dependant living as a wife of a member of the Forces may, at the discretion of the Minister, be awarded a temporary pension for a year from the date of his death. No pension is awarded if the widow is in receipt of a pension or if the claim is not made within twelve months of the death. If the unmarried dependant has a child of the deceased member in her charge and is in receipt of an allowance for such child, or if she is herself incapable of self-support, the temporary pension may be awarded beyond a year.

A supplementary allowance for rent may be granted to widows, and unmarried dependants with children may be awarded an allowance at the discretion of the Minister in certain circumstances of hardship. Where a wife's death is due to war service or hastened by it, a widower, who was dependent on her and is incapable of supporting himself, is eligible for pension provided he was not separated from his wife.

If there is a surviving parent, an allowance for the child of a member under sixteen is paid to that parent. Orphaned children are entitled to an award, usually £60 per year if the parent was an officer, and 13s. 6d. a week in any other case. Children over sixteen who are students or apprentices, or incapable of self-support, owing to infirmity, may be given an award. Special education awards, not exceeding £50 in any year, may be awarded at the Minister's discretion.

"Child" means, in the case of a widow, a child who is an eligible member of the soldier's family, a legitimate child born nine months after the end of the soldier's service, a legitimated child or an adopted child, and in the case of an unmarried wife, an illegitimate child.

Parents of a deceased member are eligible for pension if in pecuniary need by reason of old age or infirmity or any other adverse condition not of a temporary character.

APPEALS.—If the application for a pension is refused, the claimant can give notice of appeal to the Minister of Pensions, Norcross, Blackpool. Thereupon the Minister will forward to the applicant a document called the statement of the case which sets out the relevant facts taken from the service and medical history of the member, and also the medical report

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

upon which the decision to reject the claim for a pension is founded.

If he desires to question the accuracy of the statement, the claimant can send in a written reply in the form of an answer. It is often inadvisable to do this, however, unless the applicant acts on expert advice. Appeals are heard by a tribunal composed of a barrister or solicitor (who is chairman), a medical member, and a Service member.

At the hearing the applicant may be represented by counsel or solicitor or by any other person. He may call witnesses, but if he intends to call a doctor he must give seven days' notice of his intention. Evidence is not given on oath and the ordinary rules of evidence do not apply. It is therefore possible to put in letters and other documents without calling the writers of the same.

On the question of fact, the decision of the tribunal is final, but there is an appeal on law from the tribunal to the High Court (in Scotland the Court of Session). Leave to appeal must be given and, if it is, all costs of the appeal are met by the Minister. The expenses of the applicant in attending the hearing are allowable, and he is entitled to a free railway warrant. If a doctor witness is called £3 3s. may be allowed, and for a written certificate by a doctor, £1 1s. There are no witness fees payable to lay witnesses.

At present there is no way of contesting the amount of the award, but it is intended to set up special assessment tribunals in future in accordance with the provisions of the Act.

MERCHANT SEAMEN.—Pensions to merchant seamen are awarded under the terms of the Pensions (Mercantile Marine) Act, 1942.

In their case it must be shown that the death or disablement arose out of a "war injury" or "war risk injury." These terms include not only physical injury but also disease due to the special conditions of the war at sea. Officers and men of the Merchant Navy, pilots and those engaged in salvage operations at sea or in any tidal water or harbour are eligible. The rates of pensions are the same as those for equivalent ranks in the Royal Navy.

REINSTATEMENT IN CIVIL EMPLOYMENT

ANY person whose war service ended after March 21, 1944, can apply to his former employer to be taken into his employment on terms and conditions which are not less favourable than those which would have been applicable to him if he had not so served. If it is not "reasonable and practicable" to take him into employment on such terms, then he must be given employment on the most favourable terms which are reasonable and practicable.

There is no indication in the Act to show how the words "reasonable and practicable" are to be construed, but it is clear that Parliament intended that the question should be decided by the special tribunals set up, the Reinstatement Committees referred to hereafter, who will, of course, be guided by the particular circumstances of each case. The obligation thrown on the employer can be enforced by summary proceedings, and upon conviction the court can impose a fine of £100, and make an order for compensation for loss to be paid to the former employee, to an amount corresponding to the remuneration he would have been entitled to receive.

The persons entitled to benefit by the Act are men who, after May 25, 1939, have served in the armed Forces or Civil Defence Services under enrolment notice, women who after that date have entered into wholetime service in the W.R.N.S., A.T.S. or W.A.A.F., members of the nursing services attached to the armed Forces, and members of voluntary aid detachments employed under the Admiralty, Army Council or Air Council.

Applications for reinstatement must be made in writing to the employer by the applicant, or some person acting under his authority, during the period beginning with the end of his war service and ending with the fifth Monday after the end thereof. If the applicant is prevented from applying in the time stated, by sickness or other reasonable cause, he may apply as soon as reasonably possible. Applications cease to have effect after thirteen weeks from the date they are made, but this period may be renewed by a written application. It is necessary for the applicant to state the date on which he will be available for employment.

The employer taking a former employee into employment must employ him for 26 weeks, but if the applicant had before his war service been continuously employed for 52 weeks, the employer is under an obligation to employ him for 52 weeks. Temporary absence from work does not prevent the employment being continuous. No employer is bound to take an applicant into his employment if he can do so only by discharging some other person who (a)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

was employed by the former employer before the beginning of the applicant's war service, and (b) had been so employed before that date for a longer period than the applicant, and (c) was employed in work not less permanent than that of the applicant.

"Former employer" under the Act means the employer by whom the applicant was last employed within the period of four weeks immediately preceding the beginning of his war service. Where, before March 21, 1944, any change takes place in the person carrying on an undertaking, or that undertaking becomes comprised in any other undertaking, the "former employer" is to be construed to be the person for the time being carrying on the undertaking or the other undertaking as the case may be.

REINSTATEMENT COMMITTEES.— To determine questions arising under the Act, and to enforce its provisions, a number of committees known as Reinstatement Committees are constituted. Each committee is composed of a chairman selected by the Minister of Labour, a person representing the employers and a person representing employed persons. These members may be assisted by an assessor, appointed by the Minister, who has expert knowledge of the matters likely to be considered by the committee. An assessor cannot vote nor be a party to any determination or order made by the committee. Appeals from a committee's decision lie to an umpire, and may be made by the parties or by an employers' organization or a trade union on their behalf. The umpire's decision is final.

Any person who claims that the Act applies to him and that his rights thereunder have been denied to him, may apply to the Reinstatement Committee to determine any question relating to his rights. If satisfied that the former employer has defaulted in the discharge of his obligations under the Act, the committee may make one or both of the following orders: (a) An order requiring employment to be made available on such date and on such terms and meditations and at such a place as may be specified; (b) An order requiring the employer to pay compensation to the applicant to the amount he would have received if the employer had fulfilled his obligation.

No proceedings to enforce the Act can be taken until an order has been made by a Reinstatement Committee and the time for appeal against such order has expired, or until an order has been made by the umpire. Any sum ordered to be paid to an applicant by way of compensation is recoverable summarily as a civil debt (and also, it would seem, by proceedings in a civil court).

The Act has effect in relation to a person to whom it applies, whose war service ended not earlier than 26 weeks before March 21, 1944, as if his war service had ended on that date. Any employer who, with intent to evade the provisions of the Act, terminates the employment of his employee who is about to enter on war service is liable to a fine of £100. He may also be ordered to pay a sum not exceeding 26 weeks' compensation to the employee.

Disabled ex-Service men or women unable to secure or retain certain employment by reason of their disability, can register under the Disabled Persons (Employment) Act, 1944. It matters not whether the disability is due to war service or not. Any person "substantially handicapped in obtaining or keeping employment or in undertaking work on his own account" as the result of injury, disease or deformity can register, and is entitled to a course of vocational training, during which time he will be paid wages and receive free medical attention. Employment is found for the trainees, preference being given to ex-Service men and women in the allotment of jobs.

MARRIAGE

MARRIAGE is not strictly a contract, but "the voluntary union for life of one man and one woman to the exclusion of all others." In order to make a valid marriage, a person must be 16 years or over, and must not be within the prohibited degrees of affinity and consanguinity. These forbidden degrees are set out in the Book of Common Prayer, and are part of the Ecclesiastical law. They became incorporated into the statute law of England by the Marriage Act, 1836, but since that statute was passed changes have been made. The present law is set out by the Deceased's Wife's Sister's Marriage Act, 1907, and the Marriage (Prohibited Degrees of Relationship) Act, 1931, which provides that a man may now marry any of the following: (1) his deceased brother's widow; (2) his deceased wife's sister; (3) his deceased wife's brother's daughter; (4) his deceased wife's sister's daughter; (5) his father's deceased brother's widow; (6) his mother's deceased

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

brother's widow; (7) his deceased wife's father's sister; (8) his deceased wife's mother's sister; (9) his brother's deceased son's widow; or (10) his sister's deceased son's widow.

To constitute a legal marriage there must be consent. The use of force or undue influence on one party, if proved, is sufficient to support a petition to the court for a declaration that the marriage is null and void. When the parties are under 21, it is also necessary that the consent of the parents or guardians should be obtained, but if this is refused, an application can be made to a Court of Summary Jurisdiction to dispense with it.

If they are living together both parents must give their consent; if they are separated, the parent having custody of the child must consent; if one parent has deserted the other, the parent who has been deserted must consent. Where one parent is dead and a guardian has been appointed, the surviving parent and guardian must consent if they are acting jointly, but if the guardian is the sole guardian his consent is sufficient. In the case of an illegitimate child, the mother's consent is necessary, and in the case of orphans the consent of their guardian.

CELEBRATION OF MARRIAGE.— Marriage may be celebrated by a priest of the Church of England after the publication of banns, or by a priest of the Roman Catholic Church, or by a minister of a Nonconformist Church, or by a registrar in a registry office. The requirements for a marriage after banns in the Church of England are that the banns have been published on three Sundays preceding the solemnization of the marriage, and that the parties have been resident in the parish fifteen days. Where the parties reside in different parishes, the banns must be published in each parish and a certificate of such publication produced to the clergyman before he performs the ceremony. By the Marriage Measure No. 3, 1930, it is provided that the banns may be published and the marriage solemnized in the usual place of worship of either party. This dispenses with the requirement of 15 days' residence. Banns may be published and marriages celebrated in churches specially set apart for the fighting services, or at sea in a warship providing one of the parties is a member of the regular Forces at the time notice of the marriage is given.

Marriages can also be performed in the Church of England with an ordinary licence from the registrar (obtainable from the registry of the bishop of the diocese) provided one of the parties has resided in the parish for 15 days immediately prior to the issue of the licence. A special licence (usually issued at a cost of about £25) is obtainable in certain circumstances without any previous residence in the district. Under a special licence the marriage can take place anywhere at any time.

When one party is a parishioner of the parish in which the proposed marriage is to take place, and the parties have given notice to the superintendent registrar in whose parish they have resided for seven days, a marriage can take place with a registrar's certificate twenty-one days after such notice has been given. In regard to marriages in Nonconformist or Roman Catholic places of worship, the same notice of 21 days must be given for a marriage by certificate, and the same rules apply; but a marriage by licence can take place one day after entry of the notice by one of the parties, who must have resided for 15 days in the superintendent registrar's district.

The registrar attends marriages in Nonconformist or Roman Catholic places of worship (unless his attendance has been dispensed with by authority of the Registrar General). Marriages before a registrar in a registry office take place with a licence, or certificate, issued under similar conditions as for a Nonconformist or Roman Catholic marriage. Two witnesses are required for a marriage. Special facilities for the immediate marriage of members of the Forces ordered overseas are contained in the Marriage (Members of His Majesty's Forces) Act, 1941. Such marriages may take place anywhere on the appropriate permission being obtained.

It is enacted under the Marriage (Extension of Hours) Act, 1934, that a marriage may take place at any time between 8.00 a.m. and 6.00 p.m. on any day. This, of course, does not affect any church law against the celebration of marriages in Lent or other stated days.

BREACH OF PROMISE. — Engagement to marry is a civil contract, and a man or woman who agrees to marry and fails to keep the promise within the time stipulated, or within some reasonable time, may be sued for breach. As has been pointed out, a person over 16 but under 21 can marry, and therefore, although by law such person would not be able to contract save for necessaries, he or she can sue for breach of promise of marriage. Damages may be awarded on a generous scale if it should happen that the party in default is of ample fortune, and it matters not if the defendant to the action is already married, unless the plaintiff knew that he was married when the promise was made. Proof of the promise is to be found

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

generally in the conduct of the parties. It is unnecessary to prove that it has been made in express words.

A married person who during the life of his or her spouse marries another person anywhere is guilty of bigamy, which is a felony punishable by seven years' penal servitude. If at the time of the second marriage ceremony the other spouse has been continually absent from the person marrying for the space of seven years and has not been known to the other to be living within that time, there is no ground for convicting of bigamy, but the person setting up this defence must prove it.

It is also an offence to make a false declaration at the time of marriage. The Registrar-General has now issued a form of declaration to be signed by persons about to marry, drawn in the following terms:

"And well knowing also that if, contrary to my belief expressed above that there is no impediment of kindred or alliance or other lawful hindrance to the said marriage, there is in fact such an impediment, any marriage contracted in pursuance of this notice (i.e. the notice to marry) may be invalid or void and the contracting of marriage may render one or both of the parties guilty of a crime and liable to the penalties of bigamy or such other crime as may so have been committed."

HUSBAND AND WIFE

BY entering into a marriage, the parties change their legal status, and the husband especially assumes increased responsibility. He must maintain his wife, and if he does not she can either sue him for maintenance or pledge his credit for necessaries, according to his rank and station in life. The husband's obligation to maintain his wife can be enforced by proceedings against him by the wife, or by a third party (i.e. a local authority or the Assistance Board. Poor Law relief given to her is considered as having been given to him). If the wife leaves the marital home voluntarily in circumstances which do not justify such action, or if she commits adultery, the obligation to maintain ceases.

A wife is liable to maintain her husband or children or grandchildren out of her separate estate only when they are forced to apply for public assistance. The primary duty to maintain the children and grandchildren rests on the husband, and only in the event of his failing to do so can proceedings be instituted against the wife. An order for maintenance by the justices is necessary.

Marriage creates what is called a right of consortium. The husband is entitled to the society of his wife and to cohabit with her. If his work renders it necessary for him to live in a certain area, the wife should not refuse to reside with him because she does not like the district. She can refuse, but by so doing she loses her right of maintenance and may be guilty of desertion. In face of such conduct, the husband's sole legal remedy is a petition in the Divorce Division for restitution of conjugal rights, or for divorce on the ground of desertion. Any third party who entices a wife away may be sued by her husband. The wife may sue a person who has persuaded or enticed her husband to live apart from her.

Separation agreements between husband and wife, providing they are followed by immediate separation, are enforceable, but an agreement to separate in future is not, even though it be followed by the cessation of cohabitation. Although no set form of agreement is necessary, and although a mere oral agreement may be binding, the usual practice is to draw up a formal deed. This contains mutual covenants not to sue for the restitution of conjugal rights, a covenant by the husband not to interfere with or molest his wife, and a covenant by the wife indemnifying the husband against her debts during the separation. A covenant by the husband to pay an annuity to his wife may be drawn up in such a way as to limit it to the period of separation, but if it is more widely drawn, and can be construed as a permanent annuity, the liability remains after his death, and may be enforced against his executors or administrators.

WIFE AS HUSBAND'S AGENT.—A wife who is cohabiting with her husband and manages his house is presumed to be his agent. If she buys food and clothing suitable to the station in life in which the parties live, the husband is presumed to have given her his authority to do so without any formal act of acknowledgment on his part. But this presumption is rebuttable on its being shown that (a) the husband makes a substantial allowance to cover all household expenses so that she has no need to pledge his credit; or (b) that he has expressly forbidden her to do so; or (c) that she has an adequate stock of the goods ordered; or (d) that the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

necessities ordered are grossly excessive; or (e) that the tradesmen have been warned not to give credit to the wife.

A wife buys goods either as her husband's agent or on her own account as a principal, in which case she is solely liable. There is no presumption of fact that husband and wife are jointly liable for her purchases. If the parties are living apart through the fault of the husband (i.e. either because he has turned her out of the house or by his misconduct and cruelty compelled her to leave), the wife has presumed authority to pledge his credit for necessities, but there is no such presumption if she herself is at fault or if she is in receipt of alimony or money for her maintenance under a deed of separation. Necessaries mean food and clothing for the wife and her children suitable to her station in life, and also the cost of medical attention or, in some cases, legal advice.

A married woman can acquire, hold or dispose of property in all respects as if she were a single woman (or *femme sole*). She can sue or be sued for any contract or debt or obligation or tort (i.e. any injury or wrong not arising out of a contract). She can be made bankrupt, and judgments may be enforced against her. Formerly a husband was liable for any tort committed by his wife, and also for her ante-nuptial contracts and obligations, but this law was changed in 1935. A husband and wife may by agreement render themselves jointly liable in contract or tort as if they were unmarried persons.

If a wife engages in business or is entitled to property and profits for her separate use, she is assessable for income tax as a single woman, but if she lives with her husband her profits are assessed and charged in his name. Application can be made for separate assessments. In such cases the two incomes are added together in order to calculate the total amounts of reliefs to which the parties are entitled. Whether the incomes are assessed jointly or separately, the amount of tax payable is the same. If the wife does not pay her tax the husband's goods can be distrained upon as well as the goods of the wife.

Wedding presents given to a wife are her own property and so is any money she herself earns, but if she saves money out of the housekeeping allowance made by her husband, such money belongs to him. Evidence that the husband made his wife a gift would be sufficient to defeat his claim. A separation between the parties does not affect the matter.

When either husband or wife is charged with a criminal offence, the other spouse is a competent witness for the defence at every stage of the proceedings, whether the person charged is charged solely or jointly with others. But before the witness is called there must be an application by the person charged. Neither husband nor wife is compelled to disclose in evidence any communication made during the marriage. Generally speaking, the husband or wife of an accused person is not a competent witness for the prosecution, but there are certain exceptions to this rule. In cases where personal injury has been caused by one spouse, the other is a competent witness, or where it is alleged that property has been stolen from the one by the other. In bigamy charges the husband or wife of the accused is not a compellable witness, though he or she may be called without the consent of the accused.

DIVORCE AND JUDICIAL SEPARATION

UNDER the Matrimonial Causes Act, 1937, a petition for divorce may be presented to the High Court by a husband or wife on the ground that the respondent

(a) has since the marriage committed adultery; or

(b) has deserted the petitioner without cause for a period of at least three years immediately preceding the presentation of the petition; or

(c) has since the marriage treated the petitioner with cruelty; or

(d) is incurably of unsound mind and has been continuously under care and treatment for a period of at least five years immediately preceding the presentation of the petition

and by a wife on the ground that her husband has since the marriage been guilty of rape, sodomy or bestiality.

No petition for divorce can be presented until three years after the date of the marriage, unless a judge of the High Court allows it to be presented on the ground of exceptional hardship suffered by the petitioner or of exceptional depravity on the part of the respondent. If it appears to the court on the hearing of the petition that this leave has been obtained by misrepresentation or concealment, the petition may be dismissed or the decree delayed for three years.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Upon proof of connivance, that is that the adultery or desertion of one spouse has been caused or knowingly permitted by the other, or collusion, that is the presenting of a petition for divorce as a result of an agreement between the parties whereby the true facts are concealed from the court, or condonation, that is forgiveness of a conjugal offence with the full knowledge of all the circumstances, the court must dismiss a petition. A spouse who has sexual connection after knowledge of the other's adultery is presumed to have condoned the offence.

The court must inquire so far as it reasonably can into the facts alleged, and if satisfied that the allegation in the petition has been proved, and that there has been neither connivance nor collusion nor condonation, will pronounce a decree *nisi* of divorce. Discretion to dismiss a petition rests on the court where there is undue delay in presenting a petition, or the petitioner's conduct has conduced to adultery, or the petitioner has herself or himself been guilty of adultery or of cruelty or desertion, or where the petitioner's conduct has conduced to the respondent's unsoundness of mind. Proof of adultery will be inferred from circumstances showing that there was association with opportunity to commit it. Confessions must generally be corroborated.

JUDICIAL SEPARATION AND NULLITY. — A petition for judicial separation may be presented to the High Court by the husband or wife on any grounds on which one for divorce might be presented, or on the ground of failure to comply with a decree for the restitution of conjugal rights. Such a petition is dealt with as if it were a petition for divorce, but where the court grants a decree for judicial separation it is no longer obligatory for the petitioner to cohabit with the respondent. If there has been a separation order by the magistrates (*see below*), a divorce petition may be brought later, on substantially the same facts. The court may then treat the decree of judicial separation or separation order as sufficient proof of the adultery, separation, or other ground on which it was granted, but evidence must be given by the petitioner. It is illegal for either party to marry again after a decree of judicial separation or separation order, though, while it subsists, it virtually ends the marriage.

A petition for nullity of marriage may be presented on the following grounds: (a) that either spouse is physically incapable of consummating the marriage; or (b) that the marriage has not been consummated owing to the respondent's wilful refusal; or (c) that either party was at the time of marriage of unsound mind or a mental defective within the meaning of the Mental Deficiency Acts or subject to recurrent fits of insanity or epilepsy; or (d) that the respondent was at the time of the marriage suffering from venereal disease in a communicable form; or (e) that the respondent was at the time of the marriage pregnant by some person other than the petitioner. In regard to (c), (d) and (e), no decree can be granted unless the court is satisfied that the petitioner was, at the time of the marriage, ignorant of the facts alleged, that the proceedings are brought within a year, and that no sexual intercourse has taken place after the petitioner discovered the facts. Any child born of a marriage declared null and void on grounds (c) and (d) is a legitimate child.

GROUNDS FOR DIVORCE.—It is not possible in this short review to discuss the many reported cases showing the interpretation placed by the court on the statutory provisions outlined above. Adultery means voluntary sexual intercourse between either spouse and a third party during the duration of the marriage. It is usually proved by indirect evidence, but sometimes by confession of the guilty spouse. In such cases the court inquires closely into the genuineness of the confession and the circumstances in which it was made.

Cruelty, legally interpreted, means that there is a "danger to life or limb or health, bodily or mental, or a reasonable apprehension of it." On proof that the husband has infected his wife with a venereal disease, the court can find cruelty.

As a rule the court gives a wide interpretation to what is called mental cruelty, which may consist sometimes in acts of omission as well as commission, and it is always necessary to set out in the petition full particulars of the conduct upon which the petition is based.

Desertion consists in either spouse wilfully absenting himself or herself from the society of the other without the other's consent and with the intention of forsaking her or him. But if the husband's misconduct is so bad that the wife is herself forced to leave him, a charge of desertion may be proved against him. There must, however, be an actual separation of husband and wife against the will of the other spouse. Proof of this is to be found chiefly in conduct or by letters, but it does not follow that refusal to have intercourse or to occupy the same bedroom amounts to desertion. If there is an agreement to separate or to live separately there is no desertion A

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

genuine offer to return and resume cohabitation, even if not accepted by the other spouse, may end the desertion.

Proof that a person is of unsound mind can be furnished by evidence of detention in an institution in consequence of an order under the Lunacy and Mental Treatment Acts, the Army Act, the Air Force Act, the Naval Discipline Act or the Criminal Lunacies Acts. Treatment as a voluntary patient under the Mental Treatment Act, 1930, is also sufficient, but apart from detention under one of these various Acts, a person is not deemed to be detained "under care and treatment" within the meaning of the Matrimonial Causes Act, 1937, above. It is necessary that a person of unsound mind sued as a respondent should be represented by an independent person or a guardian *ad litem* (i.e. for the purposes of the litigation). Absence on leave from an institution does not break the five years period.

If the petitioning party has been guilty of a matrimonial offence, it is necessary to ask for the discretion of the court to be exercised in his favour. For this purpose the fullest disclosure of all acts of adultery committed by the petitioner is necessary. This discretion statement or confession must be filed before the case is set down for hearing and signed by the petitioner.

PRESUMPTION OF DEATH. — Any married person who contends that reasonable grounds exist for supposing that the other party to the marriage is dead, may present a petition to have it presumed that the other party is dead and to have the marriage dissolved, and, if satisfied, the court may make a decree of presumption of death and of dissolution of marriage. In such proceedings the fact that for a period of seven years or upwards the other party to the marriage has been continually absent from the petitioner and the petitioner has no reason to believe that the other party has been living within that time, is evidence that he or she is dead until the contrary is proved. In such petitions an alternative plea is on the ground of desertion. If after the court has granted a decree for dissolution on the grounds of presumed death and the decree has been made absolute (*see below*), the other party remarries, such marriage is valid even if the respondent is afterwards proved to be alive.

Remarriage cannot take place immediately after the court has pronounced a decree, for such decree is only pronounced in the first place as a temporary order. It is called a decree *nisi* and the marriage is not finally dissolved until the decree has been made absolute after six weeks have elapsed. Consequently, sexual intercourse between either spouse and a third party before the decree becomes absolute is adultery, and may result in the petition being dismissed. In special circumstances (e.g. if either party to a remarriage is going abroad), an application may be made to expedite the decree.

CUSTODY OF CHILDREN.—After a decree of divorce, the court normally grants a formal order for the children of the marriage to remain in the custody of the petitioner with a right of access. It does not follow, however, that an innocent husband will be given the custody of very young children. In all cases where questions arise as to what is best for the children, the matter is carefully investigated by the judge in chambers. Where a petition for restitution of conjugal rights has been disobeyed and is followed by a decree for judicial separation, the court generally decides the question of custody after hearing evidence as to what will be in the best interests of the children.

A husband may, on a petition for divorce or for judicial separation, claim damages from any person on the ground of adultery with the wife of the petitioner. The damages are awarded by way of compensation, not as a punishment, and are based on the ground that the matrimonial home has been broken up, that there is need for employing a housekeeper or person to take charge of the children, and that the wife's earnings, if she earns wages, are lost. By order, the court may direct that the damages be applied for the benefit of the petitioner or of the children or of the guilty wife.

Costs are in the discretion of the court. If a wife takes matrimonial proceedings justifiably, and succeeds, the husband is liable because such costs are necessaries for which she can pledge his credit, and even if the petition fails, the husband may be liable if it is shown that there were reasonable grounds for bringing the suit. A wife who has committed adultery cannot pledge her husband's credit for her solicitor's costs in divorce proceedings. If a wife has separate estate and fails in her action, she may be ordered to pay her own costs and also her husband's costs. Where a wife defends a divorce suit the costs she incurs are regarded as necessaries.

Appeals from the judge's order granting or refusing a decree lies to the Court of Appeal, which may itself grant a decree or order a new trial.

SUMMARY JURISDICTION IN MATRIMONIAL MATTERS.—There

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

is a shorter and more summary method of procedure to obtain a judicial separation, namely, by proceedings before a magistrate under the Summary Jurisdiction (Separation and Maintenance Acts), 1895 to 1925. Under these statutes any married woman

(1) whose husband has been convicted summarily of an aggravated assault upon her or convicted on indictment of an assault upon her and ordered to pay a fine of more than £5 or to undergo more than two months' imprisonment; or

(2) whose husband has deserted her; or

(3) whose husband has been guilty of persistent cruelty to her or wilful neglect to provide reasonable maintenance for herself and her infant children whom he is legally liable to maintain (which includes the wife's legitimate children by a former marriage or illegitimate children); or

(4) whose husband is an habitual drunkard or drug taker; or

(5) whose husband has been guilty of persistent cruelty to her children; or

(6) whose husband, knowing that he suffers from venereal disease, insists upon sexual intercourse with her; or

(7) whose husband has forced her to submit herself to prostitution; or

(8) whose husband has been guilty of adultery (this ground was added by the Matrimonial Causes Act, 1937, Sect. 11), can apply for an order of judicial separation from her husband to a court of summary jurisdiction.

A husband may apply for a like order if his wife is guilty of persistent cruelty to his children or is an habitual drunkard, or on the ground of his wife's adultery. The highest award the court can make is £2 per week for the wife and 10s. for each child under 16. If the parties resume cohabitation, the order ceases to have effect.

Before making a separation order on the grounds of adultery, the justices will have to be satisfied that the applicant has not condoned or connived at the adultery, by his or her wilful neglect or misconduct, and that the application has not been prosecuted in collusion with the other party to the marriage, or any person with whom it is alleged adultery has been committed.

Appeal from a justice's order granting or refusing an order for separation or maintenance lies to a Divisional Court, composed of two judges of the Divorce Division of the High Court, within eight days, but leave may be given to extend the time for appealing. The justices may order any or all of the following provisions:

(1) An order that the applicant is no longer bound to cohabit with the other spouse; (2) an order for the custody of the children of the marriage under 16; (3) an order for maintenance of the wife or children under 16; (4) an order for costs.

Summary proceedings between husband and wife are heard by three J.P.s (one of whom must, if possible, be a woman) or one magistrate. The public are excluded and only restricted reports of such cases may be given in the Press.

ALIMONY AND MAINTENANCE

WHEN a wife is a petitioner or respondent in any matrimonial cause, she can, after service of her petition on her husband or after entering an appearance to her husband's petition, file a petition for alimony pending suit. This must show her husband's means, and if he contests the claim he can file an answer setting out his income and property and also his wife's means (including, if it be the case, money given to her for her support by the co-respondent). In the event of the parties being unable to agree, the matter is investigated by the registrar, who has power to require the attendance of the parties for examination and cross-examination on oath. The order for alimony *pendente lite* (pending suit) subsists after the making of the decree *nisi* and until an order is made for permanent alimony.

In order to arrive at the amount the husband must pay, the average income is taken over three years and a calculation is made to arrive at a figure which represents one-fifth of the joint incomes. This method of assessment is usually, but not always, followed. For example, where the wife's income is very large and the husband's very small or where the husband is a bankrupt the court may make a token order or even refuse to make any order.

If there are children an allowance is made for them. Where the husband has a large income, the wife may be allowed less than one-fifth. To arrive at the true figure, deductions must be made for tax and surtax, and also, if the income be derived from real property, for repairs and maintenance. Should there be changes by way of increase or decrease of income, an application to vary may be made. In addition to alimony *pendente lite*, a wife

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

can also apply for security for costs before the suit is set down for hearing.

After obtaining a decree of judicial separation, or even after such a decree has been pronounced against her, a wife can apply for permanent alimony. If she obtains an order it remains effective until discharge by the court, although the marriage is later ended by decree. The amount usually allotted to an innocent wife is one-third of the joint incomes of the spouses.

PERMANENT MAINTENANCE. — After a decree for the dissolution of the marriage or for nullity of marriage, the court may order the husband to make provision for permanent maintenance. Where the husband is able so to do, a fixed sum payable immediately or annually may be secured for this purpose, but if the husband is only a wage earner without capital, the court may direct a sum to be paid monthly or weekly. Applications may be made at any time after the court has pronounced a decree *nisi*, but not later than a calendar month after the decree has been made absolute (except by special leave of a judge). The average allowance is one-third of the joint incomes, though, as in temporary alimony, this is not an inflexible rule.

A guilty wife may be granted maintenance on a compassionate basis, and, with the leave of the judge, she can file a petition for maintenance. This is dealt with in the same way as a petition by an innocent wife, but the allowance granted is much smaller.

Sometimes there is a claim inserted making the payment dependent on the wife living a chaste life. In nullity suits it is common to agree on an allowance for the maintenance of the wife, and indeed the court may require such provision to be made.

Orders for alimony *pendente lite* or permanent alimony or for maintenance or orders for costs can be enforced by judgment summonses. Leave to issue a summons must be obtained first from the registrar, and an affidavit of the debtor's means must be given. The summons is heard by a judge of the Divorce Division, who has power to order payment by instalments, and to make a committal order for not more than six weeks in the event of non-compliance. Full opportunity is given to the creditor or her counsel to cross-examine the debtor on oath. Although there is no rule, the practice is to investigate arrears closely, because the intention of making orders is to give support to the wife and accordingly hoarding up of arrears is discouraged.

CHILDREN

UNDER English law, a person who has not attained the age of twenty-one years is an infant or minor, and as such has a restricted power of legal action. An infant becomes of full age at the close of the day preceding his twenty-first birthday. Apart from this general principle of law, certain definitions have been made by statute. Thus, under the Children and Young Persons Act, 1933, a "child" means a person under 14 years and a "young person" a person between 14 and 17 years.

Usually when a "child" is referred to in a deed or will, it is presumed to refer to a legitimate child, unless the context and circumstances show that it is intended to mean also a grandchild or illegitimate child. The Workmen's Compensation Act gives a rather wider definition for the purposes of that statute. "Child" means not only a son and daughter, but also a grandson or granddaughter, a step-child, an adopted child or an illegitimate child.

Because of his immature years, an infant is not able to exercise the vote or to fulfil other duties of a citizen, e.g. serving on a jury. Nor can he or she enter into a contract (*see* CONTRACTS AND AGREEMENTS *above*) except in circumstances beneficial to himself, or dispose of property by will. But unless the transaction is prejudicial to his or her interest an infant can sell property in the same way as an adult.

If it is desired to bring proceedings on behalf of a person under twenty-one, a guardian *ad litem* (i.e. some person over twenty-one) must institute the action on behalf of the infant. But an infant can hold a landed estate, though he cannot grant leases or even give a valid receipt or release of a legal claim. He cannot act as a trustee or executor or as director of a limited company, or be elected a member of a local authority or as a Member of Parliament.

The law does not make any distinction between infants and adults so far as a tort (i.e. a civil wrong independent of contract) is concerned. Thus, if a minor is sued for negligence caused by his driving a motor car or damage done by trespass, his infancy is no defence to such an action, as it would be if the action were based on contract. Nor is a parent responsible for

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

torts committed by his child unless it can be shown that at the time the child was really acting as agent for his father or mother. Such a circumstance may arise where a parent permits his child to drive a motor car. In one case a father who gave his son an airgun, and permitted him to use it after complaints that the boy had used the gun recklessly, was held liable for personal injuries caused to a third party by the discharge of the gun. But if the action is founded on contract and is really an attempt to enforce indirectly an agreement, it will fail.

OFFENCES BY CHILDREN.—Infancy is not a defence in criminal proceedings, but the Children and Young Persons Act, 1933, provides that "it shall be conclusively presumed that no child under the age of eight years can be guilty of any offence." Between the age of eight and fourteen, an infant is not supposed to have reached the age of discretion, though this presumption may be rebutted if the evidence clearly shows a criminal intent. After attaining fourteen years, an infant is presumed to be capable of distinguishing good from evil and is, therefore, subject to the criminal law in the same way as an adult.

Despite this, it is now provided by various statutes that a distinction should be made between adults and persons under twenty-one so far as punishment and procedure is concerned. Special courts known as Juvenile Courts were established in 1933 to deal with charges against children and young persons. The public are excluded from such courts but the proceedings may be reported in the public Press providing the name and address of the person charged is not given, nor any other particulars which might give a clue to the identity. Bail is granted freely to children accused, and if they are ordered to be detained in custody they must be sent to a special remand home (unless of depraved character) and not allowed to mix with adult prisoners. If dealt with by the magistrates, the words "conviction" and "sentence" must not be used. Punishment usually consists of a fine or detention in a remand home (not exceeding a month) or detention in an approved school. Parents of children charged may be ordered to pay fines, damages or costs, which may be recovered by distress. Even for the gravest crimes no sentence of penal servitude may be passed on a juvenile offender. If a person under eighteen is found guilty of murder, the judge cannot pronounce sentence of death, but must order detention under such conditions as may be directed by the Home Secretary.

The local education authority is always represented in a juvenile court and there is a probation officer present also, in order that the justices may be fully informed of the education and home surroundings of persons accused. Children who are proved to be without a parent or guardian or whose parent or guardian is not exercising his duties properly or who are exposed to moral danger (e.g. where the parents have been convicted of cruelty or neglect or are of criminal habits) may be committed to the care of a "fit person," whether a relative or not. In most cases the "fit person" is the local authority, whose duty it is to find the child a home and to care for his education and training for work. Such orders remain in force until the child becomes eighteen.

CUSTODY OF CHILDREN.—At one time the father had sole custody of his child, but as the result of various Acts the rights of the mother have now been recognized. Under the Guardianship of Infants Act, 1925, either parent may apply to a court of summary jurisdiction or to the County Court for an order regarding the custody of their child and the right of access of the father. In making such orders the paramount consideration is the welfare of the child, and the conduct and wishes of the parents must be carefully investigated. Thus, it may happen that a guilty mother who has committed a marital offence may be given custody if that is best in the child's interests. Maintenance up to £1 a week may be ordered.

The religion of the father is usually regarded as the religion of the child, but if the mother having the custody of the child brings it up in her own faith instead of in the father's faith she cannot be deprived of the custody. Although there have been a large number of reported cases dealing with the matter in the past which rather suggest that the father's decision is final, the statutory direction that the welfare of the infant is the first and paramount consideration now prevails. In the case of illegitimate children the mother's wishes regarding religion and education are followed. A child over twelve who is an inmate of a rate-aided institution may be allowed to choose his own faith.

ADOPTION OF CHILDREN.—Under the Adoption of Children Act, 1926, an application may be made to the High Court (Chancery Division), the County Court or the Magistrates Court for an adoption order in respect of an infant. The proposed adopter must not be under twenty-five and must be twenty-one years older than the infant (except in cases

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

where the adopter and the infant are within the prohibited degrees of consanguinity).

A male adopter cannot adopt a female infant except in special circumstances. The adopter must be a British subject domiciled in England.

Before making an order, the court must have the consent of the parent or person having the custody of the child and liable to contribute to its maintenance, and must be satisfied that such person fully understands the sweeping effect of an adoption order. All the rights, duties, obligations and liabilities of the parents or guardian are transferred to the adopter once an order is made, and the infant is treated as though it were a child born to the adopter in lawful wedlock. He can consent to or dissent from the infant's marriage before the age of twenty-one (*see under* MARRIAGE *above*) and he is entirely responsible for his maintenance and education. The infant stands to the adopter in the position of a child born in lawful wedlock, but the adoption order does not deprive him of any right to, or interest in, property to which, but for the order, he would have been entitled under a will or intestacy, nor does it confer on him a right or interest as the child of the adopter.

NEGLIGENCE

IN law negligence means breach of a duty to do some thing which a reasonable person acting according to the ordinary principles which regulate the conduct of human affairs would do, or abstaining from doing something which a reasonable and prudent man would do. Another way of putting it is to say that any person who without just cause or excuse causes some form of harm to another, commits a tort or wrong, and is, therefore, liable to pay damages as pecuniary compensation.

Obviously this general principle of law covers the whole range of a man's duty to his neighbour, and, therefore, in setting down these few lines on the personal rights of an individual, it will be readily understood that so vast a subject can be dealt with only in vague outline. Moreover, negligence is dependent on the particular circumstances, and without knowledge of them it is not possible to say whether or not the principles of law embodied in hundreds of leading cases apply. The great axiom always to be borne in mind is *Ubi Jus ibi remedium* (where there is a wrong there is a remedy), and, therefore, if a plaintiff shows that he has been wronged the law will award him a remedy, though it may well be that the particular facts of the case are entirely new.

Nevertheless, it does not follow that every act, though harmful to another person, gives rise to an action in tort. The harm, for example, may be done under stress of necessity to prevent some greater evil, or to protect a man's rights of property, or it may be that the harm suffered is shared by others, as occurs when a public nuisance exists. Thus, it is clear that the question whether a person claiming to be wronged has or has not a right of action in tort really resolves itself into an examination of the evidence. A comparison of the actual evidence with the decided cases will supply the answer to the question.

Thus, in a celebrated case a man was allowed to maintain an action against a returning officer who had refused his vote. In another, a clergyman who unjustifiably refused to marry a couple was held liable. In each case there was a tort, and, therefore, the law allowed a remedy. It is the bounden duty of all offering service to the public to exercise care, and if it can be proved that a tort to an individual has arisen owing to failure to take due care, damages will be awarded.

A hotel keeper who let a room after it had been occupied by a person suffering from an infectious disease was held liable in damages; so was the proprietor of a Turkish bath whose customer was bitten by dangerous insects. When a man threw a lighted squib on a stall in a public fair and it was thrown by the stallkeeper on to another stall and from there again thrown off, whereupon it exploded, injuring a passer-by, the injured man was awarded damages against the first person who threw the squib. Again, when a lorry driver through lack of care allowed the lorry to dash unattended down a steep incline, damages were awarded to a man whose wife died from nervous shock caused by the mistaken belief that her child had been killed by the lorry.

DAMAGE TO PROPERTY.—Damage to property resulting from negligence is remediable by an action; so is damage or injury caused by ferocious bulls or other animals, for it is a principle of the common law that "everyone must so use his property as not to do damage to another." A man who brings on to his own land for his own purpose anything

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

likely to do mischief if it escapes, does so at his peril and must take the consequences of his act. When water from a reservoir escaped and damaged neighbouring property, the owner of the reservoir was mulcted in damages.

In regard to animals, it should be pointed out that an important distinction is made in law regarding those of a nature not likely to do damage. For instance, in order to recover damages for negligence from the owner of a dog, it must be shown that the owner knew the animal to be ferocious, that is, that it had previously bitten or attacked another person; but if the dog attacks cattle, sheep, goats, asses, pigs or poultry, it is not necessary to prove the owner's previous knowledge of its mischievous character, for it is provided by statute that damages are recoverable in such cases.

ONUS OF PROOF.—In cases of negligence the onus lies on the plaintiff to prove the negligence, though in some cases the facts may speak for themselves, as, for example, when a man throws some article through a window and injures a passer-by. It is for the judge to say whether negligence *may* reasonably be inferred from the facts proved, and for the jury to say whether it *ought* to be inferred to award damages. There is no limit to the general damages which may be awarded, but the special damages claimed, i.e. the actual sums expended on medical fees, nursing, or payment of a substitute during the plaintiff's illness arising out of an accident, must be set out in detail.

If another person is employed to do any unlawful act the person who employs him is liable. When a servant commits a tort, his master must pay if it be shown that the act was clearly within the scope of the employee's duty and course of employment. If a chauffeur driving his employer's motor car in the course of his ordinary duty causes injury or damage, the master is liable, but he is not liable if injury is caused when the chauffeur takes out the car joy-riding without the employer's permission.

There are three possible defences to an action for negligence, namely (1) unavoidable accident, (2) *vis major*, and (3) contributory negligence. No one is expected to pay for loss or damage resulting from an inevitable accident which did not arise through his negligence. Nor is he liable when forces beyond his control (*vis major*), which he could not foresee or overcome, cause injury. Contributory negligence may be successfully pleaded where the evidence shows that the cause of the damage or injury was due as much to the fault of the plaintiff as to the fault of the defendant. Such a plea is constantly raised in actions arising out of accidents on the road or collisions at sea.

Before 1945 the law distinguished between sea and land collisions. In the case of a sea collision, if the evidence showed that both sides had been partly responsible for what had happened, the court went a stage further in its investigation and decided the actual percentage of negligence. Consequently, the plaintiff might be ordered to pay thirty per cent of the total damages and the defendant seventy per cent. There was no such rule in regard to road collisions and, therefore, the plaintiff to succeed had to prove either (1) that the defendant was negligent and that he (the plaintiff) was not, or (2) that, although he was himself negligent, the defendant could have avoided the accident by exercising reasonable care. Thus, no damages were recoverable by pedestrians who failed to take care by attempting to cross a highway without looking out for oncoming traffic and without giving a driver a chance to swerve and avoid running into them.

CONTRIBUTORY NEGLIGENCE ACT, 1945.—An amendment of the law has now been effected by the Law Reform (Contributory Negligence) Act, 1945, which provides that where a person suffers damage as the result partly of his own fault and partly of the fault of any other person, a claim in respect of that damage shall not be defeated by reason of the fault of the person suffering the damage, but the damages recoverable shall be reduced to such extent as the court thinks just and equitable, having regard to the claimant's share in the responsibility for the damage. Where recoverable damages are subject to such reduction, the court has to record the total damages which would have been recoverable if the claimant had not been at fault. If the case is tried by a jury it is the jury's duty to assess the total damages and the extent to which the damages are to be reduced. If the defendant successfully pleads the Limitation Act and so defeats the plaintiff's claim, he is precluded from recovering any damages or contributions from the plaintiff.

FATAL ACCIDENTS ACTS.—Once it was a principle of the English common law that a personal action ended with death. Accordingly actions for personal injuries under ordinary circumstances could not be brought if the injured person died through his injury. To avoid this hardship, the Fatal Accidents Act, 1846 (generally known as Lord Campbell's Act), was passed. Under its provisions certain

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

relatives can maintain an action against a railway or omnibus company or any other person causing a fatal accident, and can recover compensation if the deceased would himself have had a right to sue if he had been merely injured and if he was one upon whom they depended in any way for their subsistence. The relatives permitted to sue are as follows: husband, wife, children, grandchildren, father, mother, step-parents and grandparents. By a later statute in 1934, the right was extended to illegitimate or adopted children.

Actions must be brought within twelve months after the death or within two years in case of loss of life at sea. The fact that the deceased person was insured and that the insurance money has been paid to the plaintiff cannot be taken into account in assessing damages, nor can damages be reduced because the widow is in receipt of a pension under the Widows, Orphans and Old Age Contributory Pensions Acts. The damages recovered are not liable for the deceased's debts.

A further sweeping amendment of the law was made in 1934 by the Law Reform (Miscellaneous Provisions) Act. Before this act became operative it was, as one judge said, "cheaper to kill than to maim or cripple," but now death makes no difference, for it is provided that all causes of action subsisting or resting in a person at the time of his death shall survive for or against his estate, as the case may be. Four causes of action alone are excluded, namely, defamation, seduction, inducing a spouse to leave or remain apart from the other spouse, and damages for adultery. Apart from these, the executor of a deceased person may sue or be sued. In the event of an action for negligence, a claim may be made for loss of the expectation of life, for pain and suffering and for special expenses (hospital charges and the like). The damages recoverable must not include exemplary damages and must be calculated without any reference to any loss or gain to the estate consequent on the death, though funeral expenses may be included. Where the persons who sue under the 1934 Act are the same as those who benefit under the Fatal Accidents Act, 1846, there can be duplication of damages. Death duties are payable on damages recovered under the Law Reform Act but not on those under the Fatal Accidents Act. No proceedings can be brought against the estate of a deceased person unless the proceedings were pending at his death or the cause of action arose not earlier than six months before his death and the action is brought within six months after his personal representative took out representation.

TRESPASS

A FAMOUS judge defined trespass as "an injury committed with violence, and this violence may be either actual or implied; and the law will imply violence, though no violence is actually used, where the injury is of a direct and immediate kind and committed on the person or tangible or corporeal property of a person. Of actual violence an assault and battery is an instance; of implied, a peaceable but wrongful entry upon a man's land."

Trespass to the person may consist of an assault, a battery, or imprisonment. Any touching of another person is a battery or unlawful beating. To strike a person with a missile is a battery. Assault is an attempt at a battery. It may consist of a threatening attitude if at the time the gesture is made the parties are so near that a battery is possible. Thus, to flourish a stick menacingly at a person within reach is an offence, but if the other person is twenty yards away the gesture is merely an empty threat. The same remark applies to a gun or pistol. If presented while a person is within range it is an assault within the meaning of the term.

Technically, to lay hands upon a person is to commit an offence, so is the kissing of a woman against her will, the throwing of water, or a blow struck at a horse which results in the rider being thrown. When a missile is thrown and hits anyone a battery is committed; when the missile misses its mark an assault is committed.

Imprisonment consists in the forcible restraint of another's liberty, but merely to stop a person going in a particular direction or in every direction save one is not to imprison him. To give a person into custody without proper cause constitutes in law the actionable wrong (or tort in the old Norman-French phrase) of assault, false imprisonment and trespass to the person. A civil action may be brought for false imprisonment, claiming damages.

PUNISHMENT FOR ASSAULT.—A person who has suffered an assault may either take out a summons in the police court with a view to the infliction of a fine, or bring a civil action for damages. If the justices inflict a fine no further proceedings can be brought. When they

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

dismiss the summons after hearing the evidence they are required to make out a certificate and hand it to the person against whom the complaint was made, which certificate prevents further proceedings. The justices have power to inflict a fine of £5 or two months' hard labour for assault and a fine of £50 or six months' hard labour for aggravated assault, and may, in addition, order the defendant to pay a sum towards the prosecutor's costs and to compensate him for any loss of time. They may also order the defendant to enter into a recognizance to keep the peace.

When great violence is used, the more serious charges of causing grievous bodily harm or occasioning actual bodily harm may be preferred. These are grave offences triable at the assizes, and punishable by penal servitude.

Trespass to land occurs when a person enters upon the land of another, "breaking his close." This does not mean that there must be actual breaking of a fence, for the tort of trespass is constituted in law as soon as a man sets foot in another's property. To ride over land, for example, is trespass, and persons riding to hounds or coursing who cross another's field are liable. It is better in such cases, though not strictly necessary, to give formal notice in writing that proceedings will be taken in the event of a trespass.

It is not necessary in civil proceedings for trespass to prove actual damage, so long as the violation of a man's right to his property is shown. Any forcible entry into a house is actionable, and the owner may use a reasonable amount of force in ejecting the trespasser, but before forcible ejection is undertaken it is better to request the intruder to depart peaceably. Excess of force may result in a suit for damages. Therefore, the best course is to call in a constable and leave it to him to take what action he considers best.

A common form of trespass is using a person's property without permission. It is a trespass to ride a man's horse or bicycle without his permission, and if loss result the owner may claim damages. Herein should be noted the difference between tort and contract, which may be illustrated this way. A person under twenty-one who commits a tort is liable, and so if he takes another's horse without permission and rides it lame, an action may be brought against him. If he hires the horse and rides it lame he is not liable, because the loss arises out of contract, and a person under twenty-one can make a contract only for food, clothes and other necessaries. At one time the driving of a motor car without the owner's consent for the purpose of enjoying a ride and with the intention of returning it afterwards was a civil trespass, but the Road Traffic Act, 1930, provides that such act is now a criminal offence punishable by two years' imprisonment.

PROSECUTION OF TRESPASSERS. —It is a trespass to stick bills or posters on another's house or fence or to lay telegraph wires across his land or to damage his fence or hedge. Trespassers doing actual damage may be brought before the magistrates on a summons and fined. For this reason one often sees the notice "Trespassers will be prosecuted," which is really a mis-statement of the owner's powers for he can only prosecute those causing actual damage. Against those who "break the close" by actually walking across the land without causing damage, the only remedy is a civil action for damages.

For the trespasses of his cattle or horses a man is also liable. Two remedies are open to the person upon whose land the cattle stray, causing damage. He may bring an action or he may impound and detain any animals *damage feasant* (i.e. causing damage) as a pledge until the owner pays him compensation. Dogs and cats are regarded in law rather differently, for it is recognized that by nature they wander at will, and, therefore, a person cannot destroy a trespassing dog unless it is actually doing damage. If the dog is chasing sheep it may be shot, if such action is found necessary, to prevent the destruction of the sheep, but when there is no peril to any animal and the dog is simply running across land, the person who kills it is liable to the dog's owner in damages.

INSURANCE

A POLICY of life insurance is a contract by which the insurer, in return for the payment annually of certain sums called premiums, agrees to pay a certain lump sum on the death of the insured person or his attaining a certain age. Instead of yearly premiums, an insured person may pay a lump sum. As the contract is not one of indemnity against actual loss, like a fire or burglary insurance contract, the insurer is compelled to pay the agreed sum on the happening of the event insured against, and, therefore, a man may take out as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

many life insurances as he pleases. If the insured person is killed and his relatives sue under Lord Campbell's Act for compensation, the policy cannot be put forward in mitigation of damages.

Only those having "an insurable interest" in the life of the assured can make a life insurance contract. A husband has an interest in his wife's life, a wife in her husband's, a child in his father's. As regards other persons, the question always to be answered is, has the person making the contract a pecuniary interest in the insured person's life? Obviously a creditor is pecuniarily interested in his debtor's life; so is a surety in the life of the person for whom he has become surety. The name of the person for whose benefit the assurance is effected must be expressly stated in the policy.

Where a policy is assigned by deed, or even if it is merely deposited with an assignee charging the policy with the repayment of money lent, the assignment should be notified to the company immediately, because in the event of a second assignment priority of payment will depend upon such notice. Although it is an exception to the rule that a person effecting an insurance must have an insurable interest, it is lawful to effect a policy of insurance with a collecting society or industrial assurance company for the payment of funeral expenses of a parent, grandparent, grandchild, brother or sister.

In every contract of life assurance the fullest disclosure is required on the part of the persons making the contract. Fraud on either side renders the contract void. If the company's agent is guilty of deceit the premiums can be claimed back. Non-disclosure of material facts in regard to illness or of the cause of death of the parents of the person proposing to insure, or of the fact that a previous proposal of insurance made to another company was rejected, vitiates the policy. The contract does not begin on the day the company intimate their acceptance of the proposal, but only when the first premium is paid or the company announce that the risk has begun and that they will give credit for the premium.

The conditions in the policy should be examined carefully, for they may limit the risk. Thus it is usual to stipulate that if the insured person leaves England and increases the risk by travelling in tropical countries nothing is payable, or that nothing is payable if the insured person is lost at sea, or in an aeroplane, or in the event of suicide. It has been held that the last-mentioned stipulation does not cover suicide during insanity and that in such circumstances the insurers are liable.

FIRE INSURANCE.—Fire insurance is a contract of indemnity, which means that the insurer undertakes to make good the actual loss incurred by the insured person as a result of fire. The insurance may be for £1,000, but if the actual loss is only £50 that sum only is recoverable and, in the event of total loss, only £1,000 is recoverable, whatever the value of the property. If two policies have been taken out with different companies the loss is shared in proportion to the sums named in the respective policies. When filling in a proposal form for fire insurance it is essential to disclose all material facts.

In regard to house property it is essential to disclose whether there is a garage, where it is situated, and of what material it is constructed. Fire policies endure for a year with the option of renewal by payment of a further premium within a stated time. If the premium be not paid before the end of this period a claim can be made for any loss occurring within the time allowed for renewal, but it must be disclosed immediately and before the premium is paid.

When insuring, a person must have an insurable interest, but if he has parted with all his interests at the time the property is destroyed by fire he cannot recover. The person who takes a mortgage on property, executors, or lessees for life or a term of years have an insurable interest. If goods are fully insured and after a fire the company pays the full amount they are entitled to salvage and dispose of any goods that remain.

Removal of goods from the place in which they were at the time the policy was issued avoids the policy, unless the company has been notified and has consented to the removal. Similarly, alterations to premises may give the company the right to avoid the contract. Any breach, indeed, of the conditions of the policy avoids it, unless the breach is waived by the company. Evidence of waiving would be the acceptance of premiums after the breach.

Fire insurance policies cannot be assigned without the company's consent, and, therefore, the purchaser of premises or goods should take prompt steps to advise the company of the change of ownership. An endorsement on the policy is sufficient to show that the company has assented to the assignment. If A's house is burned down through the negligence of B, and the insurance company pays A the extent of the loss covered by the policy, they are entitled to sue B and to recover from him

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the damages which A would have been in the position to recover had he brought the action.

Upon filling up the proposal form it is customary for the proposer (the assured) to pay the premium in whole or in part and to receive in return a "cover-note," which affords him protection until the proposal is accepted by the insurers and a policy issued, or until notification is given that the risk is declined. Before making payment the insurer is entitled to ask for proof that the loss has occurred through fire or some other peril included in the policy. Strictly speaking, loss by fire means a loss by ignition, but damage by water or damage caused by firemen in attempting to put out the fire is included. So also is damage due to explosion.

INSURANCE AGAINST ACCIDENT. —Insurance against accident is not a contract of indemnity like fire insurance. Consequently, if the condition of the policy is that the company will pay a fixed sum or fixed weekly sums in the event of the assured meeting with an accident, such sums become payable when the accident occurs. No sum payable under an accident policy can be set off in reduction of damages ordered to be paid by the person who caused the accident. In accident insurance the assured must have an insurable interest.

All forms of insurance are governed by the terms of the policy. It is usually stipulated that if premiums are not paid on the due date or within a period of grace, normally twenty-one days, the contract ceases and can be revived only on the stated conditions. In life policies it sometimes happens that after paying for a time the assured is unable or not disposed to continue. By that time the policy has, of course, acquired a capital value, and the company may offer to redeem it or to give in place a reduced capital sum instead of the original sum due if the assigned had paid all the premiums.

The Third Parties (Rights against Insurers) Act, 1930, provides that if the assured becomes insolvent, his rights against the insurers for liabilities to third parties shall be transferred to and rest in the third party to whom the liability has been incurred. The effect of this is to prevent the trustee in bankruptcy or receiver of the insolvent estate obtaining the benefits of the policy for the estate instead of the third party.

Under the Road Traffic Act, 1930, motorists are compelled to insure against third party risks. Such insurance is a contract of indemnity and is strictly limited according to the conditions of the policy.

LIBEL AND SLANDER

ANY statement published in printing or writing, or any sketch, cartoon or photograph which holds a person up to hatred, ridicule or contempt, or which has a tendency to injure him in his trade or profession, is a libel. Any spoken statement to the same effect is a slander. It is a matter for the jury to say what meaning is to be put on any alleged libel or slander. Sometimes the words used may appear to amount to mere satire, but when the circumstances under which they were uttered or published are fully known, it may be clear that the innuendo or special meaning to be drawn is clearly defamatory, and in such case damages will be awarded. It is not, therefore, easy to say whether or not a statement is a libel unless one is fully acquainted with the surrounding circumstances. The inference to be drawn from a picture or cartoon may be defamatory to those acquainted with the subject, though to others the drawing may appear innocent.

To impute incompetence or misconduct to a professional man, to impute drunkenness to an engine-driver or chauffeur, to impute that a grocer uses false weights, to impute that a clergyman has committed immoral conduct—all these are obvious examples of libel or slander.

Sometimes a man writes a libel about a fictitious person, but, unhappily for himself, gives the fictitious person the name of a real person. This was shown to have occurred in a leading case, where a newspaper writer wrote a fanciful description of the doings of a certain person abroad to whom he gave a name. He never intended the article to refer to the plaintiff, but the jury found that reasonable people who knew the plaintiff believed he was referred to, and heavy damages were awarded.

In order to succeed, therefore, in a civil action for libel or slander, the plaintiff must prove that the alleged libellous words refer to him and that they are defamatory. At the trial it is for the judge to find that the words are capable of conveying a defamatory meaning to a person of reasonable mind, and for the jury to say whether in fact they bear that meaning and, if so, what damages must be paid by the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

defendant for publishing the libel. If the plaintiff contends that the words are to be understood in a meaning different from their ordinary meaning, the burden rests upon him to prove this. If he fails to call evidence to this effect there is no case to go to the jury, and judgment will be given for the defendant.

Another important fact to be borne in mind is that the plaintiff must prove publication or communication of the defamatory words to some person other than himself. A libel cannot be published to the person libelled. Therefore, if A writes a defamatory letter to B, the latter has no right of action, but he will have if A knew that most probably the letter to B would be opened by C, his secretary, or if A dictated the letter to his own clerk to be typewritten, or if A wrote the libel on a postcard or sent it by telegram.

Although for many purposes husband and wife are one person in law, the sending to the wife of a defamatory letter concerning her husband constitutes sufficient publication to found an action for libel.

ACTION FOR SLANDER.—Because it is considered that the writing of a defamatory statement endues it with a measure of permanency — "the written word remains" according to the old Latin phrase—an action may be brought for libel on mere proof of publication, although the plaintiff does not prove that he has suffered any special damage. But in an action for slander damage flowing from the defamation must be proved, except in the following circumstances:

(1) Where the words charge the plaintiff with having committed a criminal offence punishable by imprisonment; (2) where the words impute that the plaintiff has a contagious or infectious disease; (3) where the words are spoken of the plaintiff in relation to his profession or business; and (4) where the plaintiff is a woman or girl, and the words impute unchastity or adultery to her.

Several courses are open to a defendant in a libel action. He may plead Justification or Fair Comment or Privilege and, in case the libel is contained in a public newspaper or periodical publication, Apology. It is a good defence in slander or libel to prove that the words spoken or published are true. The defendant who thus proposes to justify the libel has the onus of proof cast upon him, but it is sufficient if the substance of the libel is proved true without proving every detail. Where an action was brought on the statement that certain people "were a gang who lived by card-sharping," it was held sufficient justification to prove that they had, in fact, cheated at cards on two occasions.

A defendant who raises a defence of Fair Comment must in order to succeed prove that the words complained of are a fair comment on a matter of public interest. The judge decides whether the matter is one of public interest; the jury say whether the comment is or is not fair. Naturally the words "fair comment" may be given, and have, indeed, received in a multitude of reported cases, a very wide definition. Any man may hold what views he chooses, however exaggerated or wrong they may be, and it is a matter for a jury to say whether in expressing his views he has gone beyond the bounds of fair and honest criticism.

DEFENCE OF PRIVILEGE.—Although some statements are clearly defamatory they are protected by law as privileged, and, therefore, the defence of Privilege can be raised, and, if proved, it will succeed unless the plaintiff shows that the defendant has been guilty of malice. A simple illustration taken from domestic life explains this defence. In giving a reference to a servant, a mistress can state what defects she has noticed in the girl's character or in her ability as a worker. This is defamatory, but no action lies because the law attaches privilege to the occasion. Should the mistress go further and state that the girl is drunken or immoral, or make other untrue allegations, it may be contended by the plaintiff that such allegations are evidence of malice sufficient to rebut the defence of Privilege.

Statements made by a judge, though defamatory, are privileged, and so are statements by witnesses in the court, provided they refer to the matter being investigated by the court. When a newspaper apologizes and pays money into court it must prove that the libel was published without negligence or malice, and that before the action commenced, or as soon as possible afterwards, an apology for the libel was inserted. In addition to the award of damages to the plaintiff, the court may grant an injunction restraining the defendant from repeating the libel.

In certain grave cases criminal proceedings may be instituted in respect of a libel. No civil remedy is available in respect of a libel on a deceased person, but a criminal prosecution may be brought if the libel is likely to provoke the dead man's family to commit a breach of the peace. While living together husband and wife cannot sue each other for libel, but if they are judicially separated, then an action may be successfully brought.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE CIVIL AND CRIMINAL COURTS

CIVIL actions are heard in the County Court or the High Court of Justice, though there still exist certain ancient courts like the Liverpool Court of Passage, the Salford Hundred Court of Record, and the Palatine Chancery Courts, which exercise local jurisdiction. Procedure varies in the different courts, but the law of evidence is the same everywhere and at the close of the case the judge gives judgment on the same grounds, namely, that on the evidence before him the balance of probability lies with the successful party. This differs from the requirement of a criminal trial, where the prosecution must always prove beyond reasonable doubt that the accused is guilty. Judgments are enforced, if necessary, by distress and also in certain cases, e.g. wilful refusal to pay a debt or to comply with a court injunction, by imprisonment.

COUNTY COURTS.—Where the sum claimed in contract or tort does not exceed £200, or in equity £500, or in Admiralty matters £300, or in salvage £1,000, the matter may be brought in the County Court. If an action is first brought in the High Court and remitted to the County Court for trial on the order of the High Court the jurisdiction is unlimited. Bankruptcy and rent restriction cases are heard in the County Courts, but since July 5, 1948, workmen's compensation cases have been removed from the county courts and are now heard by special tribunals under the National Insurance (Industrial Injuries) Act, 1946.

There are 400 County Courts in England and Wales, each a district court exercising general jurisdiction within a prescribed area (which is not in any way related to county boundaries). The judge—referred to as "His Honour Judge"—is clothed with full judicial authority within the limits named above and has power to commit to prison for contempt of court, but certain minor jurisdiction also rests on the registrar, who is a solicitor (addressed as "Mr. Registrar").

Appeal in any action founded on tort or contract lies as of right against a County Court judge's decision, where the debt or damage claimed exceeds £20, or upon any point of law or equity, but in other cases it is necessary first to obtain the judge's leave. Appeals are heard by the Court of Appeal, which has power to set aside the judgment or confirm it or to order a new trial. It is, however, bound by the County Court judge's findings of fact.

The procedure of the County Court lies in the speedy despatch of business and in the low cost of litigation, which is strictly controlled by the rules.

THE HIGH COURT.—There are three divisions of the High Court which exercise the jurisdiction of a court of first instance, namely the King's Bench, Chancery, and the Probate, Divorce and Admiralty Divisions. Under the statute the High Court is regarded as one entity, and, therefore, these divisions are to be regarded only as branches, not as separate courts. Accordingly any division can deal with an action properly brought in the High Court, but in practice a judge who finds a case has been put in the wrong list transfers it.

A judge of any of the three divisions is styled "Mr. Justice" and addressed as "My Lord." A judge of the Court of the Appeal is styled "Lord Justice" and also addressed as "My Lord." The Lord Chief Justice presides over the King's Bench Division assisted by nineteen so-called puisne judges, and the President over the Probate, Divorce and Admiralty is assisted by six puisne judges. In the Chancery Division are six judges.

Actions are allotted to the three divisions as follows:

Chancery: Administration of estates, mortgages, contracts for the sale or leasing of land, trusts, company winding up or reconstruction.

King's Bench: Contracts, torts, petitions of right, applications for *habeas corpus*, certiorari or prohibition. Two or more judges of the King's Bench sitting together may form a Divisional Court and constitute a court of appeal from the decisions of magistrates on cases stated on points of law.

Probate, Divorce and Admiralty: Petitions for divorce, nullity, restitution of conjugal rights, actions arising out of probate and administration of estates, salvage and possession of ships, actions arising out of sea collision and claims in prize. Two judges of this Division sit as a Divisional Court where appeals are heard from matrimonial causes heard by magistrates.

HOUSE OF LORDS.—Any litigant dissatisfied by a decision of the Court of Appeal may appeal to the House of Lords with the leave of the Court of Appeal. If this is refused he can ask for leave to appeal from a House of Lords tribunal. As a judicial tribunal the House of Lords consists of the Lord Chancellor and the nine Lords of Appeal in Ordinary (the law lords). Their decisions are final and are binding on all lower courts.

In the High Court certain matters are dealt with, not in open court, but in chambers either by the judges or by the masters of the court, who have jurisdiction to give judgment in undefended actions

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and to make orders in interlocutory matters. If a judge is of opinion that the action involves a long and detailed examination of figures or other matters, he has power to refer it to an Official Referee, who has jurisdiction to give judgment.

Costs in all civil matters do not follow as of course, but are in the discretion of the judge and court.

CRIMINAL COURTS. — The courts which deal with ordinary criminal matters are: (1) Petty Sessions, (2) Quarter Sessions, (3) Assizes, (4) Central Criminal Court, (5) King's Bench Division of the High Court, and (6) Court of Criminal Appeal.

(1) Petty Sessions.—The courts are often referred to as courts of summary jurisdiction, or, more popularly, as police courts. Justices of the peace or magistrates preside and they have very wide powers. If there is a stipendiary magistrate (in London a stipendiary is called a metropolitan police magistrate) he sits alone and has full powers, but otherwise to constitute a petty sessions two magistrates are required. In the City of London the Lord Mayor or one alderman sitting alone has the full powers of a court of summary jurisdiction.

In criminal matters the court can, except in the case of grave offences, dispose of the case summarily and may inflict fines or sentences of imprisonment with or without hard labour, not exceeding twelve months.

When a fine is imposed a period of seven days is usually allowed for payment unless the court orders that no time shall be allowed, or the offender fails to prove that he has a fixed place of abode, or the court is satisfied that the offender has enough money to pay the fine immediately. Failing payment, the alternative imprisonment is as follows: Fine not exceeding 10s., seven days; exceeding 10s. but not exceeding £1, fourteen days; exceeding £1 but not £5, one month; exceeding £5 but not exceeding £20, two months; exceeding £20, three months.

When a person is charged with an offence for which, on summary conviction, he can be sentenced to more than three months' imprisonment, he can at the hearing and before evidence is given claim to be tried by a jury. He must be informed of this right by the court. If the charge is only triable on indictment, it is the duty of the court to hear the whole of the evidence for the prosecution and then decide whether or not a case has been made out for the accused to answer, and to commit the accused for trial or dismiss the charge accordingly.

Magistrates have also civil jurisdiction in disputes concerning master and servant, in matrimonial causes, in affiliation in the adoption and guardianship of children, in regard to landlord and tenant where the rent is below a certain amount, and in various other matters, and have also cast upon them the duty of granting licences for licensed premises, clubs, moneylenders, etc.

QUARTER SESSIONS.—These courts are composed of magistrates presided over by a chairman (generally a barrister of seven years standing). They have criminal and appeal jurisdiction in regard to certain matters decided at petty sessions. Criminal cases are tried on indictment before a jury; appeals are heard by an appeal committee selected from the magistrates' rota. In certain cases a court of quarter sessions must state a case for the opinion of the King's Bench Division, which has power to review or quash any order, not being a case tried on indictment, made by a court of quarter sessions and which is brought before it on a *certiorari*. In boroughs the quarter sessions are presided over by a paid judge known as the recorder, who sits with a jury to try criminal cases and is the sole judge. Rating appeals are heard at quarter sessions.

ASSIZES.—These courts are held in important cities, usually four times a year, to try grave criminal cases. The presiding judge is a judge of the King's Bench Division or special commissioner appointed by the King. There is no appeal jurisdiction attached to such courts.

For the City of London, Middlesex and parts of Essex, Surrey and Kent, the assize court is the Central Criminal Court, which sits twelve times a year in London. The judges are the Judges of the High Court, the Recorder and Common Serjeant of London and the Commissioner and the Lord Mayor and Aldermen of the City of London. The Lord Mayor opens the sessions and during the hearing of cases he sits with the aldermen on the bench with the paid judges, who alone conduct the trials and inflict sentences.

Though no longer exercised, powers still remain in the King's Bench Division of the High Court to try on indictment any case of treason, felony or misdemeanour. It can order any proceedings of an inferior court (except those tried on indictment) to be brought before it and may confirm or quash the finding, or make any order it considers just, or remit the case to the court below with instructions to rehear it or to determine it as directed.

Appeals from quarter sessions and assizes are heard by the Court of Criminal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Appeal, which is composed of the Lord Chief Justice and all judges in the King's Bench Division. Three judges usually hear appeals. Appeal in criminal cases lies on questions of law or fact, or of mixed law and fact, and, if leave of appeal is granted, on sentence. The court has the power to affirm or quash a conviction.

The Court of Criminal Appeal has not by statute, however, any power to order a new trial, but in a case where it was held that a trial of an appellant had been a nullity, an order was made for trial on the indictment. It can increase or decrease sentences.

WILLS AND INTESTACY

IT is advisable that a person who has property of any kind and who desires to dispose of it after his death in a particular manner should make a will. To do this certain rules must be followed, rules easy to understand, for the legal requirements for a will are simple. No particular form of words is required, and, indeed, it is advisable to avoid the use of technical legal phrases and to write the directions of the testator in the plainest language.

The will must be attested by two witnesses present at the same time. Compliance with this rule is imperative. Failure to observe it may lead to the will being declared void. The testator must sign at the foot of the will—anything written after the signature not being valid—and then the witnesses must sign their names and add their addresses and occupations. The attestation must be as follows:

> Signed by the said AB, the testator, in the presence of us, present at the same time, who in his presence and in the presence of each other subscribe our names as witnesses.
> CD—of—Foreman.
> EF—of—Clerk.

Any person can witness a will, but it is provided by statute that no witness or the wife or husband of a witness can take any interest under the will. If a person who is given a legacy under a will acts as a witness the will is not thereby invalidated, though the legacy is null and void. Persons under twenty-one, if of an age to comprehend the nature of an attestation, can act as witnesses. When alterations or erasures are made in a will the testator must sign his name opposite them and the witnesses must do the same. If after signature it is desired to make an alteration this should be done by a separate document, called a codicil.

No special form of words is required for a codicil—just a statement in simple language that it is a codicil of the will of AB bearing such and such a date, and setting out what part of the will it is intended to revoke or amend, or what fresh disposition is to be made. Codicils must, like wills, be signed and attested by two witnesses in each other's presence.

SOLDIERS' WILLS.—A person under twenty-one cannot make a will, except he be a soldier on active military service or a sailor at sea. Soldiers or airmen while engaged on a military expedition, or sailors at sea, can make a disposition of their property by a verbal or nuncupative will. When proved on oath by witnesses to whom the declaration was made, such nuncupative wills are admitted as valid wills. A soldier who was mortally wounded said in the presence of his comrades, "I give all to mother," and this in due course was admitted to probate as a will bequeathing all his property to his mother. It must be understood that in peace time soldiers and sailors cannot make nuncupative wills but must comply with the formalities of the law like other people.

Wills of British subjects made out of the United Kingdom are valid as regards their personal estate (i.e. everything except freehold land) if properly made and executed according to the law of the place where the will was made. The fact that a testator who has made a properly executed will in England dies abroad does not affect the validity of the will.

If two or more persons, say a husband and wife, or parent and child, die in an accident or shipwreck or under such circumstances as make it uncertain which survived the other or others, it is presumed (apart from any order of court to the contrary) that death occurred according to seniority and, therefore, the youngest person was the survivor. Accordingly, property passing under any will or intestacy follows this rule of survivorship.

LOST WILLS.—When a will cannot be found after the testator's death the court may, nevertheless, admit it to probate and order its directions to be carried out if it can be proved by unimpeachable witnesses that a will has been made and has not been revoked, and that its contents were known to such witnesses. In one case the evidence of a single witness, who was, moreover, interested in the will, was accepted. A person may revoke a will by burning it or tearing off his signature or by making a subsequent

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

will. Marriage revokes the will of a man or a woman, unless such will has been expressly made after January 1, 1926, in contemplation of marriage.

It is a felony, punishable by penal servitude, to steal or for any fraudulent purpose destroy, cancel, obliterate or conceal any will or codicil in whole or in part during the lifetime or after the death of the testator. A will speaks and takes effect as if it had been executed immediately before the testator's death.

The rule of the court in construing the terms of ambiguous wills is to give intention to the written words in their ordinary and natural meaning. Where the writing is not decipherable by the naked eye a magnifying glass may be used. In one case a piece of paper was pasted over certain words in a will, but when the document was held against a window-pane it was easy to read them and the court admitted them to probate.

In disposing of property it is not necessary to give it absolutely; it can be tied up on trust for a time. The limit allowed by law for the duration of a restriction on property is the life of any person in being at the date of the will or the death of the testator or twenty-one years afterwards. Thus a direction that the income from certain property should accumulate until twenty-one years after the death of the testator's youngest living descendant is valid.

By paying a small fee a testator may deposit his will at Somerset House, where it will remain in safe custody until after his death unless he writes stating his desire to revoke it. Information regarding the depositing of wills may be obtained from the Registrar, Somerset House, London.

DUTIES OF EXECUTORS.—The person named in the will as executor must first bury the testator in a manner suitable to his estate, or, in case special directions are given as to cremation, arrange for that to be done. Funeral charges (which include cremation expenses) have priority over the other debts. After the funeral the executor must prove the will, unless he wishes to renounce probate, that is to say not act as executor, in which case he must do so at once before dealing in any way with the testator's estate. An uncontested will is proved at Somerset House or at one of the district probate registries throughout the country, where full information may be obtained as to the steps necessary to be taken. When the various affidavits have been sworn and the value of the estate agreed by the registrar and the fees paid, a document called the probate is handed to the executor. It is then his duty to call in all debts owing to the deceased, pay his creditors, and distribute the assets among the beneficiaries according to the directions in the will.

When a will has been proved it can be read at Somerset House on payment of a small fee, and if desired a copy may be obtained at a cost based on its length. Executors who find it difficult to construe a will may protect themselves by applying to a judge in chambers and carrying out his order.

Although it is not a rule of law it is usually accepted that an executor is allowed a year from the date of death to pay the testator's debts and distribute his estate among the beneficiaries. If this is not done executors should be asked to explain why they have not discharged their duty with due diligence. Before distributing the estate it is advisable to insert an advertisement in a daily or weekly newspaper circulating in the district in which the property is situated requiring any persons interested to send to the executors or personal representatives particulars of any claims in respect of the property. This is provided by the Trustee Act, 1925, and applies notwithstanding anything in the will to the contrary.

Generally speaking, if a legatee does not survive the testator the gift lapses and falls into residue, but, unless the will contains a contrary provision, a gift to a child or other issue of the testator does not lapse if the legatee leaves issue who are alive at the time of the testator's death.

RIGHTS OF TESTATOR'S DEPENDANTS.—Owing to the provisions of the Inheritance (Family Provisions) Act, 1938, there is no longer under English law complete freedom to dispose of property by will. Any of the following dependants of a testator—wife or husband, daughter unmarried or by reason of mental or physical disability incapable of supporting herself, infant son or son incapable of supporting himself by reason of mental or physical disability—may apply to the High Court if they are so-minded, and if the court is of opinion that the will does not make adequate provision for the dependant, an order for reasonable provision may be made in such terms as the court thinks fit. No application may be made if the testator has bequeathed not less than two-thirds of the income of the net estate to a surviving spouse and the only other dependants, if any, are the children of that spouse.

There is a restriction on the allowances which the court may order if it decides to vary the will. Where the testator leaves a wife or husband and also one or more dependants, not more than two-thirds of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the annual income of the net estate may be made the subject of an order under the Act; where the testator does not leave a wife or husband or leaves a wife or husband and no other dependants, not more than one-half of such annual income. If the net estate is £2,000 or less an order may be made for the payment of capital subject to the restrictions referred to above. Before making an order the court has power to inquire into the dependant's relations with the testator and the probable reasons for his omission from the will. Applications for an order must be made within six months after the executor or administrator has taken out administration of the estate. Persons beneficially interested in the estate may apply to have orders varied.

INTESTACY. — When a person dies without making a will, a power to distribute his property, called Letters of Administration, is made by Probate Registry at Somerset House, London, or at the registry in the district in which the deceased person lived, as the case may be. The person appointed as administrator is bound, after paying any debts owing by the intestate, to distribute the property according to the rules given hereafter. He stands towards those entitled to benefit in the position of a trustee and must render an exact account of the estate.

At one time when an illegitimate person died his estate passed to the Crown, but now, by virtue of the Legitimacy Act, 1926, an illegitimate child can take the same interest in his or her mother's estate as if he or she were legitimate, and the mother of an illegitimate succeeds as if she were the sole surviving parent. So far as other illegitimate persons are concerned, the policy usually followed by the Treasury is to treat near surviving relatives considerately. In such cases application should be made to the solicitor to the Treasury, petitioning that as a matter of grace the claim of the Crown be withdrawn or modified.

The rules for the distribution of the estate of a person dying intestate are as follows:

1. If the intestate is married, the widow or widower receives:
   (a) all personal chattels (furniture, books, motor-cars, pictures, clothes, etc.) absolutely;
   (b) £1,000 free of duty with interest at 5 per cent from the day of death;
   (c) If there are no children of the marriage the income from the residuary estate for life;
   (d) If there are children half the income from the residuary estate.
2. After the claims of the widow or widower have been satisfied, the remaining part of the estate (known as the residuary estate), is held on what are called statutory trusts for the children of the marriage in equal shares. If a child has died before the intestate leaving issue, the grandchildren take the share of such child; a posthumous child is also included. Where there is no surviving spouse, all the estate goes to the children
3. Where there are no children the residuary estate is divided equally between the intestate's parents, or passes wholly to the surviving parent absolutely.
4. Where there are neither children nor parents, the residuary estate is held on the statutory trusts for the following, in the order stated:
   (a) Brothers and sisters of the whole blood and the children of any who are dead.
   (b) Brothers and sisters of the half-blood and the children of any who are dead.
   (c) Grandparents in equal shares.
   (d) Uncles and aunts and the children of any who are dead. Under this rule first cousins and their issue may succeed.
   (e) Uncles and aunts of the half-blood and the children of any who are dead.
   (f) Widow or widower absolutely.

Failing these relations or a surviving spouse the estate becomes the property of the Crown.

GAMING AND WAGERING

ALL contracts or agreements by way of gaming or wagering are null and void under the provisions of the Gaming Acts, 1845 and 1892. In a celebrated judgment Mr. Justice Hawkins defined a wagering contract in these terms:

"A wagering contract is one by which two persons, professing to hold opposite views touching the issue of a future uncertain event, mutually agree that dependent upon the determination of that event, one shall win from the other, and that other shall pay or hand over to him, a sum of money or stake; neither of the contracting parties having any other interest in that contract than the sum or stake he will win or lose, there being no other real consideration for the making of such contract by either party."

It follows from this that the winner of a wager cannot sue the loser or holder of the stake for his winnings, and money deposited upon an illegal wager on some future event can be recovered, provided an action is brought *before* the time has elapsed on which the result of the wager rests. If, however, there enters into the transaction between the parties a fresh consideration which is not illegal, the matter may be taken outside the Gaming Acts. Thus, where the winner agreed not to brand the loser as a defaulter provided the loser paid the money at a later date, it was held that this was a fresh contract

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

founded on legal consideration and therefore the winner could recover. Where a person holds money resulting from bets as an agent for another person, the principal can recover it by an action, but if the principal gives money to an agent to place on a bet and the agent fails to lay the bet the principal cannot sue the agent.

ILLEGAL GAMING.—In law games of skill are lawful; games of chance unlawful. But it is not always easy to decide on which side of the line a game falls, because of the hundreds of reported cases which are by no means easy to reconcile. A game may be unlawful if the chances are not alike favourable to all the players, including among the players the person by whom the game is managed or against whom the players lay stakes. On the other hand, it may also be an unlawful game if all the players have equal chances.

Some games have been declared illegal by statute. At present the following are unlawful:

Ace of hearts, faro, basset, hazard, passage, roulette, every game of dice except backgammon, baccarat, chemin-de-fer, and every card game which is not a game of skill. Progressive whist drives, carried on for money prizes or prizes contributed by those playing, are unlawful. Automatic machines worked by inserting coins have been held to be machines used for unlawful gaming, because the chances are not equal, but strongly in favour of the owner of the machines.

A home or place used for the playing of unlawful games is a common gaming house, under the Gaming Act, 1845, and the owner or keeper of such home and all persons assisting are liable to a fine of £100. An order may be made for the destruction of tables or instruments of gaming found on the premises. Under the Gaming Houses Act, 1854, any person who keeps or uses his premises for the purpose of unlawful gaming, or any person assisting in conducting the business, may be fined £500 on summary conviction or sent to prison for twelve months. Police may enter any house, suspected of being a common gaming house, on a magistrates' warrant (or in London on the authorization of a commissioner of police). Persons who obstruct the entry of a constable or refuse to give their names and addresses, or give false names and addresses, are guilty of an offence.

Betting is not unlawful, but by statute it has been made an offence to bet by particular methods or in particular places. Thus it is provided that "no house, office room or other place shall be used for the purpose of the owner or any person using the same" for the purpose of ready-money betting. Nevertheless, a bookmaker may open an office and accept bets by telephone or by post on a credit basis presumably because the backer does not hand over the money but merely promises that he will pay on a future day. If the premises are used for betting and money is paid to the "keeper" (i.e. the person who runs the business) by backers, the house or place is also a common gaming house within the Gaming Act, 1845 (*see above*), and the keeper is liable to £100 fine or six months' imprisonment. There are statutory powers to search suspected premises on a justice's warrant. It is also an offence to take or settle bets in streets.

LOTTERIES.—A lottery is constituted when money or a prize is distributed by chance among those who have paid money for that chance. All lotteries are unlawful. Any person who (a) prints tickets or chances for use in a lottery; (b) sells, distributes or advertises or has in his possession for sale or distribution tickets; (c) prints an advertisement of a lottery or any list of prize winners or other matter calculated to induce persons to participate in a lottery; (d) brings or invites others to send lottery tickets or advertisements into Great Britain; (e) sends money out of Great Britain for lottery tickets; (f) uses or knowingly permits the use of premises for a lottery; or (g) causes or procures any person to do any of the above acts, is guilty of an offence (£100 fine on summary conviction or £500 on indictment).

A lottery promoted as an incident to an entertainment is not to be deemed an unlawful lottery providing the whole proceeds of the entertainment (including the proceeds of the lottery), after deducting the expenses of the entertainment, excluding expenses incurred in connection with the lottery, and the expense of the lottery tickets, and such sum (not exceeding £10) on account of expense incurred by the promoters in purchasing lottery prizes, are devoted to purposes other than private gain. In addition, no prize in the lottery must be a money prize, tickets must be sold on the premises where the entertainment is held, and the facility to participate in the lottery must not be the substantial inducement to attend the entertainment.

A "private lottery" is now lawful under statutory conditions. Sale of the tickets or chances by the promoters must be confined either (a) to the members of one society established and conducted for purposes not connected with gaming, wagering, or lotteries; or (b) to persons all of whom work in the same premises; or (c) to persons all of whom reside on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

same premises. The promoters must come within the classes of persons or public places, but "any ground used for the purpose of a racecourse for racing with horses or adjacent thereto on the days on which races take place" is excluded.

The promoter referred to in (a), (b) or (c) above must be authorized by the society to conduct the lottery. Society includes "club, institution, organization or other association of persons by whatever name called, and each local or affiliated branch or section of a society shall be regarded as a separate and distinct society" (Betting and Lottery Act, 1934, sect. 24). The whole proceeds (after deducting expenses) must be devoted to the provision of prizes or, in the case of a society, to the objects of the society. No advertisement of a private lottery must be exhibited save on the premises of the society, the price of the tickets and the names and addresses of the promoters must be shown on the tickets, and no ticket must be sent by post or allotted except by way of sale. Breach of any of these conditions is an offence.

Totalisators are legal on certain approved racecourses and dog tracks. It is an offence to advertise that a house or place is kept or used for betting purposes or to send any letter, circular, telegram or advertisement relating to betting or inviting "any person to make or take any share in or in connection with any bet or wager." To send any communication to a person whom the sender knows to be an infant (i.e. under twenty-one), inviting him to take any share in a betting or wagering transaction, is a statutory misdemeanour punishable by a fine or imprisonment or both. Knowledge of infancy is presumed if the communication is sent to a person who is attending a school or university unless the sender proves that he had reasonable cause to believe the person was of full age.

Ready money betting on football is prohibited. It is an offence to conduct in or through any newspaper any trade or business in which prizes are offered for forecasting future events (e.g. football pools) or any other competition, success in which does not depend to a substantial degree on the exercise of skill on the part of those participating in the competition.

SCOTS LAW

The Law in Scotland as applied to Sales of Land, Feus and Feu-Duties, Contract, Leases, Marriage, Husband and Wife, Maintenance, Divorce and Judicial Separation, et cetera

SALES OF LAND

THE law and practice relating to the sale of land is one of the most technical and involved departments of the law, and no attempt can be made to sketch it within the limits of this article. The prospective buyer or seller will normally employ a solicitor to carry through the whole transaction, but since lay parties sometimes involve themselves in the preliminary stages of settling the bargain without taking professional advice, it is desirable to draw attention to the requirements of the law in connection with contracts for the sale of land. And by land is meant land either with or without buildings on it, for when a house, for example, is sold what is really sold is the land on which it stands.

MISSIVES OF SALE.—No agreement for the sale of land is enforceable unless it is in the form of a probative writing. A probative writing is one which is either (a) signed by the party before two witnesses, the witnesses also signing; or (b) holograph, that is, written entirely in the handwriting of the party signing, in which case witnesses are not necessary; or (c) adopted as holograph, i.e. not in the party's own handwriting but endorsed by him at the end "Adopted as holograph" and signed by him, in which case also witnesses are not necessary.

The missives (i.e. the letters or other documents in which the terms of the contract are embodied) must be probative on the part of both buyer and seller, and they also require to be stamped with a sixpenny stamp as for an agreement.

The chief provisions in the missives are the price to be paid, the time of entry and an undertaking by the seller to give a good and clear title, but other provisions are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

frequently included with regard to fittings and fixtures in the house, and similar matters.

SALES BY PUBLIC ROUP (i.e. AUCTION).—When property is sold by auction the conditions of sale are embodied in a document known as The Articles of Roup. A prospective buyer should read carefully the articles before attending the bidding, as they may contain incidental obligations, such as to take over certain fittings. The bidder to whom the property is knocked down signs a formal probative minute confirming his purchase, but until he signs such a minute he is entitled to refuse to proceed with the purchase on the ground that he has not committed himself by probative writing.

EXAMINATION OF TITLE.—It is inadvisable for a prospective buyer to enter into negotiations for the purchase of a property without first having the title examined on his behalf by a solicitor. Indeed, in view of the very technical nature of the subject, both buyer and seller are well advised to act, at all stages, only through solicitors or under professional advice.

FEUS AND FEU-DUTIES

WHEN A feus a piece of land to X, what really happens is that A (called the superior) transfers the land to X (called the vassal) on condition that X shall pay a certain annual sum known as feu-duty and shall, moreover, observe such other conditions as may be laid down in the deed (it may be a feu charter or a feu contract) by which the land is transferred. When this has been done X is for all ordinary purposes the owner of the land and may build on it, sell it, lease it, and generally exercise all the rights of ownership so long as he continues to pay the feu-duty and observe the conditions of the feu. When one refers to the owner of the land, therefore, it is X who is meant, though in the background there is A to whom the feu-duty is payable.

FEU CONDITIONS.—In feu contracts and feu charters the superior sometimes retains the mineral rights, sometimes he lays down restrictions or conditions as to the type of building that the vassal may erect on the land, and sometimes he may even restrict the kind of business that may be carried on. The superior may enforce these conditions in the courts.

FEU-DUTY.—Once the amount of the feu-duty is laid down it is fixed for all time, no matter how valuable the land may become or how often it may change hands. If X sells his land to Y then, of course, Y, the new vassal, becomes liable for feu-duty in place of X, though X would remain liable for any arrears due at the time of sale. If the vassal falls into arrears with the feu-duty he may be sued by the superior.

A may sell his superiority to B and in that case B becomes X's superior and so entitled to payment of the feu-duty as well as being entitled to enforce the feu conditions. The purchase of a superiority—or the purchase of feu-duties, as it is sometimes called—is often little more than a form of investment, i.e. B lays out so much capital to purchase the superiority and in return he receives an annual payment by way of feu-duty.

CONTRACT

SUBJECT to the difference mentioned below the general principles of the law of contract are similar in Scotland and England and the reader is therefore referred to the article on CONTRACT in the section dealing with English law. That article, however, must be read subject to the following notes dealing with those points on which the Scots law of contract differs from the English law:

CONSIDERATION. — The chief difference is that the doctrine of consideration forms no part of the Scots law of contract. Consequently a one-sided obligation is enforceable. Thus, for example, in the case of an offer to sell, a mere undertaking by the seller to keep the offer open for a certain period is binding in Scotland. It would not be binding in England unless there was some consideration (e.g. a payment) or unless it were made in a deed under seal.

FORM OF CONTRACT.—In Scotland certain particular contracts do require writing, and usually probative writing at that (e.g. contracts relating to land and buildings, and contracts of service for more than a year), but the Statute of Frauds does not apply in Scotland, nor does Section 4 of the Sale of Goods Act.

IMPOSSIBILITY OF PERFORMANCE.—It has always been the law in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Scotland that when a contract is avoided on the ground that performance has become impossible, any payments made in advance under the contract are repayable.

CAPACITY OF PARTIES TO CONTRACT.—In Scotland pupils and minors are under certain disabilities or restrictions in the matter of entering into contracts. This subject is covered in detail in the article dealing with PARENT AND CHILD.

LEASES

LANDLORD AND TENANT

THE LEASE.—A valid lease must satisfy certain conditions, viz.: (a) if it is to endure for more than a year it must be in the form of a probative writing (*see* SALES OF LAND for explanation of this term); but a verbal lease is valid for any specified period up to a year; (b) there must be a rent; (c) there must be a specified time of expiry; (d) the tenant must have entered into possession. Except in leases of shootings and trout fishings, a lease that satisfies these conditions is binding on all persons succeeding to the title of the original landlord. Thus, if the landlord sells the property the lease, nevertheless, remains valid, until its specified time of expiry, against the new owner.

SUB-LETTING AND ASSIGNATION.—Unless otherwise specifically provided in the terms of the lease, sub-letting and assignation are not competent in leases of agricultural subjects of normal duration, but they are competent in leases of residential property (with the exception of furnished houses).

RESPECTIVE OBLIGATIONS OF LANDLORD AND TENANT.—In the absence of express stipulation to the contrary, the landlord is held liable to give the tenant full possession of the subjects in good order and condition and fit for the purpose for which they are let. In agricultural leases the tenant must keep the buildings and fences in good tenantable order. But in leases of town property the obligation is on the landlord to keep the premises in tenantable order (though often the lease itself puts this obligation on the tenant); the landlord's duty in this matter is to the tenant personally and so a member of the tenant's family, for example, would have no ground of action against the landlord for damages for injuries suffered on account of the bad condition of the premises. Where the obligation to maintain the condition of the premises is on the tenant, yet he is not liable to restore them should they be damaged or destroyed by some cause for which he is not responsible; in that event, indeed, the tenant is entitled either to insist on a reduction of rent or to abandon the lease altogether, depending on the extent of the damage.

The premises must be used by the tenant only for the purposes either specified in the lease or implied by the character of the premises let. Thus the tenant of a dwelling house may not use the premises as a shop without the landlord's consent.

The tenant must take and retain possession of the premises. This does not mean that, for example, he must actually live in a dwelling house leased by him, but it does mean that he must not allow the premises to become dilapidated.

There is an obligation on the tenant to plenish. This means in the case of residential property that he must bring in plenishings to the value of the rent at least, and in the case of agricultural subjects that he must stock the farm and cultivate the land.

IMPROVEMENTS.—In town property the tenant has no claim against the landlord for improvements made by him to the premises during his tenancy. He is presumed to have made them in the hope of recouping himself in terms of comfort or convenience during his tenancy.

FIXTURES.—In the case of business premises it is usually provided in the lease that machinery, etc., may be removed by the tenant at the end of the lease, but even in the absence of express stipulations the tenant would probably be allowed to remove it. In the case of a dwelling house, however, the tenant has not such a strong claim to remove fixtures in the absence of provision in the lease.

RATES.—The tenant is liable for occupier's rates (except in the case of small houses under the House Letting and Rating Act), but in the case of a lease of furnished premises the landlord is bound, in the absence of agreement to the contrary, to relieve the tenant of such payments.

RENT.—If the landlord fails to fulfil his obligations the tenant may withhold the rent. (In the event of a serious breach by the landlord, however, the tenant may abandon the lease altogether; for example, if the landlord fails to maintain the tenantable condition of the property in a case where he is bound to do so.) The landlord has a right of security for one year's rent over the ordinary equipment,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

furniture and stock-in-trade on the premises and this right takes priority over other creditors of the tenant. The right does not extend to goods belonging to the tenant's family or to lodgers, nor does it apply to agricultural subjects over two acres, while in the case of small houses under the House Letting and Rating Act, 1911, it does not apply to bedding material, implements of trade nor to the first £10 worth of furniture. The landlord's right is made effective by his raising an action of sequestration for rent in the Sheriff Court and obtaining a warrant to sell the goods over which his security extends. Sale is by public auction.

REMOVAL.—Even where the lease states an express time of expiry the landlord must give the tenant notice to remove, and this rule holds even where the lease states that notice is not required. Likewise, the tenant must give notice to the landlord if he wishes to remove. If neither party gives notice to the other then the lease continues on the same terms for another year where the original period was a year or more, or for the same period where the original was less than a year. Where the lease is for a year or more notice must be in writing, but where for a shorter period the notice may be verbal. The length of notice required varies according to the character and duration of the lease, thus:

Lands exceeding two acres. Lease for more than two years, not less than one nor more than two years' notice. Lease for less than two years or for year to year, six months' notice

Lands not exceeding two acres, houses, fishings and shootings. Lease for a year or more, at least forty days' notice. Lease for more than four months but less than a year, at least forty days' notice unless otherwise stipulated. Lease for four months or less, notice equal to at least one-third of time of duration of lease, unless otherwise stipulated.

Small dwelling houses under the House Letting and Rating Act, 1911. Let for three months or more, at least forty days' notice before next rent day or "lawful date" as the case may be. Let for less than three months, notice equal to at least one-third of the duration of the let given before the next rent day or lawful date. Let for less than a month, at least five days' notice.

With regard to such small dwellings the following rules apply:

(i) These periods of notice stand irrespective of any agreement between landlord and tenant to the contrary.

(ii) If the tenant is in arrears of rent for seven days or more, the landlord may give him forty-eight hours' notice to remove.

(iii) The "lawful date" of removal referred to above is (a) In a let of one month or more, noon on the twenty-eighth day of a month, but if the twenty-eighth day is a Sunday, then on the following Monday. (b) In a let of less than a month, any Monday. If the lawful date does not fall on the day when the next payment of rent is due, then the notice does not expire until the lawful date next following.

REMOVAL TERMS.—Always provided nothing to the contrary is agreed between parties, where the date of entry or of termination under a lease is Whit Sunday (which is nominally May 15), the actual date of entry or removal is May 28; and where entry or termination is Martinmas (which is nominally November 11), the actual date of entry or termination is November 28.

MARRIAGE

MARRIAGE is founded on the consent of the parties. But it is not a contract that can be dissolved by consent; it is a status or institution the legal obligations with regard to which are regulated by the law of the land.

IMPEDIMENTS TO MARRIAGE.—A marriage between persons either of whom is under sixteen years of age is void; and since real consent is essential, a marriage entered into in circumstances that preclude such consent is likewise void. For example, there is no real consent where one of the parties is in such a mental condition on account of insanity or intoxication as to be incapable of understanding the nature of the engagement being entered into, or is under such force or fear as to exclude true consent.

There are also certain forbidden degrees of blood relationship: relations in the direct line of ascent or descent (e.g. father and daughter); collaterals nearer than two degrees (e.g. brother and sister); collaterals where one is in a position similar to a parent to the other (whether of full blood or not and whether legitimate or not), such as the brother or sister of a direct ascendant to the other (e.g. uncle and niece, aunt and nephew, grand-uncle and grand-niece, grand-aunt and grand-nephew). But by Act of Parliament marriage is now allowed between a widower and his wife's sister; between a man and his deceased brother's widow; between a man and (a) his deceased wife's niece, (b) the widow of his deceased uncle, paternal or maternal, (c) his deceased wife's aunt, (d) his deceased nephew's widow.

Where there is a subsisting prior marriage between one of the parties and a third person, then, of course, that party cannot enter into a second marriage. To

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

go through the ceremony of such a second marriage would be to commit the crime of bigamy.

Impotency on the part of one of the parties does not of itself constitute a bar to marriage, but it is a ground on which the other party can ask the court to declare the marriage null.

REGULAR AND IRREGULAR MARRIAGES.—Marriages are either regular or irregular. These terms do not refer to the validity of the marriage but simply to the mode in which the marriage is constituted. There are two forms of regular marriage: (a) Marriage celebrated by a minister of religion after due proclamation of banns in church or publication of notice by a registrar. It must be registered within three days. (b) Marriage before an authorized registrar. This is a new form of marriage introduced by the Marriage (Scotland) Act, 1939. There must be prior proclamation of banns or publication of notice, but the Act makes provision for the sheriff to issue a licence for the marriage in cases where the parties can show reasonable excuse, e.g. illness, for not having proclaimed banns or published notice; such a licence is equivalent to a registrar's certificate of publication and is valid for ten days. In this form of marriage the parties sign a declaration before the registrar, who is himself bound to register the marriage.

Since the 1939 Act there is now only one form of irregular marriage, namely, Marriage by Habit and Repute. This occurs where the man and woman have cohabited over a period of time (the court usually requires several years) and have held themselves out as husband and wife without in fact having ever gone through a marriage ceremony. Such a marriage as this can be established only by action of declarator in the Court of Session, and, once established in this way, it is as valid for all purposes as either form of regular marriage. The so-called Gretna Green marriages are now invalid.

BANNS.—The party must have been resident in the parish for fifteen days preceding. If the two parties are resident in different parishes, proclamation is necessary in both parishes.

NOTICE.—The party giving notice must have been resident in Scotland for the preceding fifteen days. If one party is resident in England a certificate granted in England in respect of that party is accepted in Scotland, and vice versa.

HUSBAND AND WIFE

HUSBAND and wife must adhere to each other, i.e. live together in family. It is the husband's right, as head of the household, generally to regulate the household and fix the place of residence, and in the absence of just cause the wife must follow the husband wherever he is. Whatever the domicile of the wife before marriage, after marriage she takes the domicile of her husband.

But the courts will not compel adherence. So if the wife refuses to live with her husband, his remedy is to refuse to aliment her and/or to raise an action of divorce. And if the husband puts his wife out of the house she cannot compel him to take her back; her remedy is to sue him for aliment or for divorce (*see* the articles following on ALIMENT and DIVORCE AND JUDICIAL SEPARATION).

The husband is not allowed to beat his wife or to imprison her in his house, but he may prohibit any person, even his wife's relatives, from visiting her in his house.

The husband may raise an action for damages against anyone who entices his wife away from him so as to deprive him of her society

The wife has now full power of control and management of her own estate as if she were unmarried, unless she is a minor, in which case the husband is her curator. (For explanation of the term curator *see* the article PARENT AND CHILD.)

ALIMENT.—The husband is bound to aliment his wife, that is, to supply her with necessary food and clothing suitable to her station. For fuller treatment of this matter *see* the article on ALIMENT AND MAINTENANCE.

WIFE'S DEBTS AND CONTRACTS. The husband is not liable for debts contracted by the wife before marriage. During the marriage, however, the wife, as manager of the household, has a presumed authority to pledge the husband's credit for household necessaries such as food, clothing, medicine, medical attention, furniture and domestic servants, but such items must be of a kind suitable to the husband's standard of living. This authority to pledge the husband's credit, it should be noted, is only a presumed or implied authority and, therefore, it may be withdrawn by the husband. There are three ways in which the husband may withdraw it:

(a) By expressly notifying individual tradesmen privately. Public advertisement is not

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

effective unless it can be proved that the tradesman saw the advertisement.

(b) The husband may revoke the authority by implication, for example, by giving his wife an allowance adequate to meet the household necessaries. In such a case tradesmen who supply goods to the wife cannot recover the price from the husband, even although they were not aware that the authority was withdrawn. But if the husband had already permitted a course of dealing between his wife and a tradesman, he would require to give the tradesman specific notice that the authority was withdrawn.

(c) The third method is by the process known as Letters of Inhibition. This is a legal process initiated by petition to the Court of Session. The Inhibition is registered in the General Register of Inhibitions, and thereafter the husband is freed from liability.

It should be noted that the husband may effectively withdraw the authority only if he himself continues to provide the necessaries otherwise. If he fails to provide them he will still be liable in spite of his having withdrawn the authority. The reason for this is that the husband's obligation to provide the necessaries is an absolute legal obligation from which he cannot escape. The purpose in withdrawing the authority is to control the activities of a spendthrift wife or to restrict her to her minimum rights.

ACTIONS AT LAW.—A wife may now sue and be sued as if she were unmarried. The husband is not liable for the wife's wrongful acts (unless committed in course of acting in those matters over which the implied authority referred to above extends), except where he is an accessory to them or where the wife can be held to commit them under his instructions.

ALIMENT OR MAINTENANCE

THE obligation to aliment means the obligation to provide maintenance or support for indigent persons. It arises in two cases: (a) as between husband and wife: (b) as between kindred.

AS BETWEEN HUSBAND AND WIFE.—The husband is bound to supply his wife with necessary food and clothing suitable to her station. Even where the wife is living apart from her husband on account of his misconduct or with his consent, the husband is still liable for necessaries supplied to the wife unless she has sufficient means of her own or he is paying her a suitable allowance or she has agreed to support herself. But where the wife leaves the husband without his consent or without good cause he is not bound to aliment her. If a wife has separate means more than sufficient for her own maintenance she is bound to aliment her husband if he is unable to maintain himself.

AS BETWEEN KINDRED. — The father is bound to aliment his child. The obligation is to keep the child from want, want being judged according to the social position of the parties. The obligation remains on the father so long as he is alive, irrespective of whether the child has reached majority (twenty-one years of age) or not, but it is suspended whenever the child becomes self-supporting. The father must aliment the child while it is being trained for a trade or profession. But once the child reaches full age and has completed its training the obligation is suspended. If the child cannot earn a livelihood by its profession, the legal obligation is on the child to try some other means. If the child is unable to earn a livelihood at all, however, the father's obligation revives, even if the child is of full age.

The father may fulfil his obligation in the manner least burdensome to himself provided no injury is thereby caused to the child. Thus, an offer by the father to maintain the child in the father's home is a complete answer to a claim by the child for funds to enable it to live away from home.

If the father has no means to enable him to fulfil his obligation then the mother becomes liable. Failing her, the obligation passes to the paternal ascendants (paternal grandfather, paternal grandmother, paternal great-grandfather, etc., in that order) and, failing them, it passes to the maternal ascendants.

The obligation between parent and children is mutual, so that a parent (or for that matter a grandparent) is entitled to aliment from his child (or grandchild). In this case, however, the amount does not depend on the station in life of the child but on what is necessary to give the claimant a bare subsistence relative to his position. Sons and daughters are equally liable. Unlike the case of a claim by a child against a parent, where a parent claims against a child it is no answer for the child to offer to maintain the parent in the child's own home.

In the case of illegitimate children, if the father has admitted paternity or if it has been established against him by the court, the liability rests equally on the father and mother in the first instance, unlike the case of a legitimate child, where the father alone is first of all liable. If neither the father nor the mother can

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

provide aliment the obligation does not pass to ascendants; in that event it is for the Poor Law Authorities to look after the child. The liability of the parents lasts until the child is sixteen years old, but if the child is incapacitated from supporting itself by then, the liability lasts as long as the incapacity remains. In determining the amount of aliment the court may have regard to the means of the parents and the whole circumstances of the case. An illegitimate child is not obliged to aliment its parents.

There is no obligation to aliment as between brothers and sisters, but a child succeeding to a parent's estate might be required to aliment its brothers and sisters if it was found that they were not adequately provided for.

ALIMENT IN SEPARATION AND DIVORCE.—Where a husband obtains from the court a decree of separation the court may award the wife aliment although she was at fault. The amount is in the discretion of the court, but seldom exceeds one-third of the husband's income.

A divorced wife, on the other hand, is not entitled to aliment for herself. But if she is given the custody of the children she is entitled to aliment for them. A wife who divorces her husband is not entitled to aliment either, but she is entitled to other provisions (*see* the article on DIVORCE).

REPAYMENT.—Anyone who supplies necessaries to an indigent person is entitled to repayment from the party liable for the aliment of that person. So a tradesman can claim against the husband for necessaries supplied to the wife; and if a child has separate income of its own a parent may claim repayment from that income of sums expended by way of aliment.

DIVORCE AND JUDICIAL SEPARATION

DIVORCE

THE court must have proof of the grounds alleged by the party seeking the divorce. A mere confession by the guilty party is not enough; and there must not be any collusion between the parties, i.e. the putting up of a false case or the withholding of a just defence. If, after decree has been granted, it can be proved that there has been collusion, the decree will be rescinded.

An action of divorce may be taken on any of the following grounds: (i) adultery, (ii) wilful desertion, (iii) cruelty, (iv) incurable insanity, (v) sodomy or bestiality, (vi) presumed death.

ADULTERY.—It is no defence in an action based on adultery that there has been adultery on the part of the pursuer. Where there is adultery on both sides a cross-action would be competent, and if successful neither party would have any claim against the estate of the other (*see* paragraph below on EFFECT OF DIVORCE ON PROPERTY). Condonation or forgiveness is a good defence. Thus, if the parties cohabit after the fact of adultery is known to the innocent party, that would amount to condonation, and once the offence has been condoned it can never afterwards be founded upon; there would require to be a new act of adultery.

Connivance is also a good defence, but to support this plea the defender must show that the pursuer gave active encouragement or provided opportunities for the defender to commit the act.

WILFUL DESERTION.—The defender must have wilfully and without reasonable cause deserted the pursuer and persisted in such desertion for a period of not less than three years. The desertion must have been without the pursuer's consent, and the pursuer must be able to show that during the whole period and right up to the date of raising the action he or she was willing and entitled to call upon the defender to adhere. So the pursuer must not be guilty of any such conduct as would justify the defender in leaving, for if guilty the pursuer would not be entitled to demand adherence.

INCURABLE INSANITY.—It must be proved that the defender is, and has been for five years immediately preceding the raising of the action, under care and treatment as an insane person. Incurable insanity is then presumed, but it is still open to the defender to prove otherwise. The court is not bound to grant decree if it is of opinion that the pursuer's wilful neglect or misconduct has conduced to the insanity.

CRUELTY.—The cruelty must be such as amounts to danger to life or health, mental or bodily, and even the mere threat of such cruelty may be enough. The test is whether it is safe for the pursuer to continue to live with the defender. Habitual intoxication amounts to cruelty if of such a kind as to make the defender at times dangerous to himself or herself or to others, or if he or she is found to be incapable of managing himself and his affairs with reasonable competence.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SODOMY AND BESTIALITY.—The crime must have been committed after the marriage.

EFFECT OF DIVORCE ON PROPERTY.—The innocent party is entitled to those "legal rights" in the estate of the guilty party that he or she would have obtained on the death of the guilty party, with the exception that the husband has no claim for *jus relicti* against the estate of his divorced wife (*see* paragraph on LEGAL RIGHTS in article on WILLS AND INTESTACY). The guilty party, on the other hand, loses all claim to legal rights in the estate of the innocent party. And, as mentioned above, where both parties are guilty and there is a successful cross-action, neither has any claim on the estate of the other.

Where the ground of divorce is incurable insanity, however, the pursuer has no claim for legal rights. On the contrary, the court may order the pursuer to pay a capital sum or a periodical allowance for the benefit of the defender and any children of the marriage.

PRESUMED DEATH.—Where there is no direct evidence of the death of one of the spouses, but circumstances indicate that he or she is dead, the other spouse may apply to the Court of Session for a decree of dissolution of the marriage on the ground of presumed death. Where the only ground for presuming death is prolonged absence, the application cannot be made earlier than seven years since the absent spouse was last heard of, but where the application is on other grounds it may be made at any time.

Such a decree dissolves the marriage just as completely as a decree of divorce, but it differs from divorce in that it does not entitle the applicant to legal rights in the estate of the other spouse.

(Where it is desired to distribute the estate of any person who may be presumed dead, separate application must be made to the court for a declaration of presumption of death. Such a declaration indeed establishes the death of the person for all purposes except for the purpose of dissolution of marriage.)

JUDICIAL SEPARATION

THERE are two grounds on either of which an action for judicial separation may be founded, namely adultery and cruelty. These are, of course, also grounds for divorce, but where a husband has an income (from which aliment is payable) and has very little or no capital (from which legal rights are payable), a wife may choose to take an action of separation and aliment rather than of divorce. By so doing she would obtain a regular income so long as the husband had an income, whereas if she obtained a decree of divorce the share in her husband's estate would be valueless.

The decree does not dissolve the marriage or entitle the parties to contract another marriage, but it entitles the innocent spouse to live apart.

As regards effect on property, the only effect is in relation to property acquired by a wife subsequent to her obtaining a decree of separation against her husband; in the event of the wife dying intestate (i.e. without leaving a will), the husband has no claim to any share in such property, the property being distributed according to the rules of intestate succession, and it is distributed as though the husband were dead.

The party obtaining the decree can subsequently bring an action of divorce on the same ground, and the facts proved in the action of separation will be accepted in the action of divorce without further proof.

PARENT AND CHILD

PUPILS AND MINORS, TUTORS AND CURATORS.—All children under twenty-one years of age are called minors; but more strictly boys up to fourteen and girls up to twelve are pupils, and between those ages and twenty-one they are minors, and the term minor is used in the stricter sense in what follows.

Both pupils and minors are under certain legal disabilities in dealing with their property, and the law, therefore, provides for them legal guardians or administrators whose duties are to safeguard the administration of the child's property. This guardianship is quite different in character from the right of custody which is dealt with below.

A tutor is the legal guardian of a pupil. The father is the pupil's natural and legal tutor, and on the father's death the mother becomes tutor in his place. Either parent may appoint a tutor to act in his or her place on his or her death, and such appointee acts jointly with the surviving parent. Should the parents die without making provision for a tutor, the court may appoint a factor in place of a tutor, such a factor being responsible to the court for his administration.

A pupil has no legal capacity at all to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

contract or litigate, therefore all contracts and litigations relating to the pupil are carried through in the name of the tutor as such. Any contract entered into by a pupil in his own person is null and void and cannot be founded on, though the price of necessaries supplied or a loan for the pupil's benefit may be recovered.

A curator is the legal guardian of a minor. A minor, unlike a pupil, does have a legal capacity, albeit qualified capacity, to manage his own affairs. If he has no curator any transactions entered into by him in his own name are valid, but if he has a curator he must have the curator's consent. All transactions, however, are subject to the qualifications (a) that he cannot dispose of his heritable property (i.e. generally speaking, lands and buildings) for nothing, nor can he will it away from the heir; and (b) that he may at any time during minority or four years afterwards have the transactions rescinded on the ground that they have caused substantial injury to his estate, e.g. if he sells some part of his means or estate for a ridiculously low figure or even if, having received a fair price, he has squandered the proceeds. Such rescission, however, cannot be effected if the minor held himself out to the other party as of full age and was believed; or if, after reaching majority and having full knowledge of the facts and of his legal rights, he ratifies the transaction; or if the transaction is in connection with some business or trade being carried on by him.

The father is the natural and legal curator of his minor children and he can appoint another person to act as curator on his death. The mother is never curator. A judicial factor on a pupil's estate automatically becomes curator when the pupil reaches minority. If a minor has no curator he can obtain one by petition to the Court of Session. All tutors and all factors in lieu of tutors are accountable to the accountant of court for their transaction, but curators are not so accountable.

CUSTODY.—The father, and on his death the mother, has full authority over the person and upbringing of a child under sixteen years of age. Once the child reaches sixteen the parent's legal authority is diminished, but the precise degree remaining cannot be defined. It ceases, however, if the child leaves home and takes up an independent life, and the father may forfeit it by reason of cruel or unnatural behaviour. When there is a dispute before the court as to the custody of a pupil child, the court will settle the question on the basis of what is in the best interests of the child; it will not regard the father as having a better legal right than the mother, or vice versa. But in the case of a child between the age of pupilarity and sixteen, the father does have a prior claim over the mother except where it would be to the child's moral or material disadvantage to have the father as custodian.

ILLEGITIMATE CHILDREN. — An illegitimate child suffers a number of legal disabilities. The law regards his parents as strangers in blood to him and so the child has no relations until he has legitimate children of his own. The mother is the child's legal custodian; the father has no right of custody or administration, but he is bound to provide aliment. The court, however, may make an order regulating the custody. Where the mother of an illegitimate child dies without leaving legitimate issue, the illegitimate child (or, if he is dead, his issue) is entitled to the same share in the mother's estate (but not in the father's) as if he were legitimate. But otherwise the illegitimate child has no legal claim against the estate of the parents on their death, either for legal rights or rights in intestacy, though, of course, it is competent for the parents to make provision for the child by will.

An illegitimate child is legitimated if the parents subsequently marry, provided that at the time of the child's conception there was no legal barrier to the marriage of the parents.

ADOPTION OF CHILDREN.—Until the passing of the Adoption of Children (Scotland) Act, 1930, the contract of adoption was not recognized in Scots law, and the parent always had the right, notwithstanding any agreement he had entered into, to reclaim the child. Under the Act, however, the court now has power, on the application of any party desiring to adopt a child, to make an adoption order. Such an order has full legal force and transfers the custody, maintenance and education of the child to the applicant, but it does not interfere with the child's rights in succession to the real parents' estates, nor does it confer any such rights in the estate of the party adopting. The Act applies to children under twenty-one and unmarried.

CRIME.—Children under eight cannot be put on criminal trial.

A child over eight but under fourteen years of age cannot be sent to prison unless it is so uncontrollable that it cannot properly be dealt with in any other way, and the court so certifies. No person under seventeen can be sent to penal servitude, and no one under eighteen years of age can be sentenced to death.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

WILLS AND INTESTACY

WHAT is stated below under the headings WILLS and INTESTATE SUCCESSION must be read in conjunction with what is stated under LEGAL RIGHTS.

WILLS

A will must be probative (*see* SALES OF LAND for explanation of this term), but otherwise it does not require to be in any particular form. So long as it clearly indicates the testator's intentions it will be given effect; but persons intending to make a will are, nevertheless, well advised to consult a solicitor. The testator (i.e. the person making the will) must have legal capacity to test. A pupil has no capacity. A minor can will his moveable estate without restriction but he cannot, even with his curator's consent, will away his heritage from the heir-at-law (i.e. the person who would succeed to the heritage should he die intestate). A will takes effect only at death; consequently, it may be revoked or amended by the testator at any time.

As is shown immediately below, under the heading INTESTATE SUCCESSION, the law lays down certain rules directing how a person's estate is to be distributed when there is no will. It is probably true that the manner of distribution under these rules is in many cases very different from what the deceased would have directed had he made a will. It is, therefore, a matter of importance and prudence that persons owning property should make a will.

INTESTATE SUCCESSION

A person who dies without leaving a will is said to die intestate (or if, having left a will, he omits to deal with some particular part of his estate, he has died intestate as regards that part). In that case, his estate is distributed according to certain legal rules known as the Law of Intestate Succession. These rules are not the same for heritage as they are for moveables and they must, therefore, be considered separately under these two headings.

HERITAGE. — Broadly speaking, heritage means land and buildings. The general rule is that heritage descends, where possible, males taking before females, an older male before a younger one of the same degree of relationship, and the issue of a person who has predeceased taking that person's share. The order of succession is:

(i) *Descendants*, i.e. children (sons, then daughters), grandchildren, etc. Males always take before females and an older son takes before a younger. The issue of a predeceasing descendant take in their order the share the parent would have taken.

(ii) *Collaterals*. If the deceased leaves no descendants the heritage goes to collaterals, i.e. to brothers, whom failing to sisters. Collaterals of the full blood take before those of the half-blood, so although the general rule is that brothers take before sisters, yet a sister of the full blood takes before a brother of the half-blood. By the half-blood is meant children of the same father but a different mother; those of the same mother but a different father have no rights at all in the father's heritage. If the deceased had both younger and older brothers, then on the principle that heritage descends where possible, the immediately younger brother (or his issue if he is dead) would take first, failing him the next younger or issue and so forth; and failing younger brothers altogether the immediately elder brother or issue would take, then the next older or issue and so forth.

(iii) *Ascendants*. If there are no collaterals the succession goes to ascendants, i.e. first to the father or, if he is dead, to his brothers and sisters in the same order as for the deceased's own brothers and sisters. Failing them it goes to the father's father and his collaterals and so on, ascending through the male line. The deceased's mother and her relatives have no right of succession at all.

Where heritage goes to a male line it always goes to only one particular male in that line, but when it goes to a female line it goes jointly to all females of the same degree. Thus, if A dies intestate leaving three sons, the heritage goes to the eldest son; but if A leaves only three daughters, they all take jointly, the issue of any predeceasing daughter taking their mother's share on the general principle of male before female and an elder son before a younger.

MOVEABLES. — Moveables are those kinds of property not included in heritage and, broadly speaking, comprise money, stocks and shares and similar securities, furniture and personal belongings. In intestate succession to moveables the mother has certain rights, as noted below, but relations through the mother have no rights, except as in qualification (c) below. There is no preference of males over females or of an elder male over a younger in the same line. Relations of the full blood take before those of the half blood, but those of the half blood take before a more distant line of the full blood. Subject to all these conditions and subject also to the qualifications stated below, the succession goes as follows:

(i) *Descendants*. All in the same line take equally, the issue of a predeceasing descendant taking equally among them the share that would have gone to their parent had he survived. Thus, if A dies leaving

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

two sons, a daughter, and two nephews who are the issue of a predeceasing daughter, then the two sons and the daughter each take a quarter of the moveable estate, and the remaining quarter is divided equally between the two nephews.

(ii) *Collaterals.* Failing descendants the succession goes to collaterals and their descendants i.e. to brothers and sisters, whom failing to nephews and nieces. In this case also the issue of a predeceasing next-of-kin take their parents' share equally between them.

(ii) *Ascendants.* Failing collaterals and their descendants, the succession goes to the father and his collaterals and their descendants and failing these it goes to the grandfather and his collaterals etc.

The foregoing rules of moveable intestate succession are, however, all subject to these qualifications:

(a) If the intestate leaves no issue but leaves a father and brothers and sisters, the father takes half in preference to the brothers and sisters.

(b) If the father is dead the mother takes the half-share.

(c) If there are neither father nor mother nor issue, nor brothers and sisters german (i.e. with same father and mother) or consanguinean (i.e. with the same father) then brothers and sisters uterine (i.e. with same mother, but different father) take one half.

(d) The heir-at-law (i.e. the heir to the intestate heritable property) has no share in the moveable estate unless he chooses to collate, i.e. to throw the heritable estate into a common pool with the moveable estate. If he does so he takes an equal share with the others in the common pool.

(e) When a man dies intestate and without leaving lawful issue, the widow gets the whole of his estate, both heritable and moveable, if the net value does not exceed £500. If the estate exceeds £500 in value, the widow gets £500, payable proportionately from heritable and moveable. A surviving husband is also entitled to the same right in his wife's estate.

LEGAL RIGHTS

It is not possible in Scotland entirely to disinherit a surviving spouse or surviving children, for the law gives them certain legal rights in the deceased's estate, to which rights they have an absolute title in spite of the fact that the deceased has left them nothing in his will. These legal rights are:

(i) *Terce.* This is the right of a widow to a liferent of one-third of her husband's heritable estate (i.e. an income during her lifetime equal to one-third of the revenue coming from the heritable estate). The liferent may be valued and redeemed for a capital sum

(ii) *Courtesy.* This is the right of a surviving husband to a liferent of the whole of the heritable estate left by the wife, but the husband's right is conditional on there having been a child born of the marriage who has been heard to cry and who would be the mother's heir if he survived. So there is no courtesy for the husband if there is a child surviving from a previous marriage of the wife, for that child is the wife's heir. Courtesy, like Terce, may be valued and redeemed.

Terce and courtesy are claims against the heritable estate, but there are also claims against the moveable estate, viz.:

(iii) *Jus Relictæ.* This is the widow's right to a share of the moveable estate. The share is one half if the husband leaves no surviving children (or if the children in his lifetime have given up their claim to legitim) or one-third if there are children entitled to legitim.

(iv) *Jus Relicti.* This is the corresponding right of the husband in his widow's moveable estate, one-half or one-third as the case may be.

(v) *Legitim.* This is the claim by surviving children. It amounts to one half of the moveables if there is no surviving spouse entitled to Jus Relictæ or Jus Relicti (or if the surviving spouse has renounced her or his claim), and one-third if there is a surviving spouse with a claim. The amount is divided equally between the children. Any child who, during the parent's lifetime, received advances from the parent (e.g. to set up in business, but not for maintenance or education) is, generally speaking, bound to bring in such amounts to the legitim fund before he or she can take a share.

The heir-at-law is excluded from a share of legition—just as he is from other moveable estate—unless he collates. (*See* qualification (d) under heading MOVEABLES above).

Legal rights are due whether the deceased leaves a will or not. Moreover they are payable in addition to any express bequests under a will. But the will may state that the bequest is in lieu of legal rights and in that case the legatee must choose either the legal rights or the bequest; he cannot have both.

Legal rights, again, are payable only from the free estate remaining after payment of debts. In cases of intestacy legal rights as well as debts must be satisfied first of all; it is the amount remaining after satisfaction of these that falls to be distributed according to the rules of intestate succession.

THE SCOTTISH COURTS OF LAW

OMITTING special courts, such as those dealing with licensing, valuation, etc., the following are the Scottish courts of law:

CIVIL COURTS

JUSTICE OF THE PEACE SMALL DEBT COURT.

—Jurisdiction is limited to debts up to £5 where the debtor is resident in the county. Solicitors cannot appear for parties, but it is possible for a party to be represented by a member of his family. There is no appeal on the merits of a case decided in this court.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SHERIFF'S SMALL DEBT COURT.—Where the claim does not exceed £20 in value or is restricted to that amount, the action must be taken in this court. Parties may conduct their cases personally, or by a member of their family, or by some other person allowed by the sheriff, or by a solicitor. There is no appeal on grounds of law or fact, but an appeal lies to the High Court of Justiciary on grounds of malice or oppression on the part of the sheriff or on other grounds amounting to a denial of justice.

SHERIFF'S SUMMARY COURT.—This is the court having jurisdiction where the claim exceeds £20 but does not exceed £50. Appeal is competent from the sheriff substitute to the sheriff principal. Further appeal lies to the Court of Session if the sheriff gives a certificate to that effect.

SHERIFF'S ORDINARY COURT.—The jurisdiction here covers claims over £50 up to any amount. The court also has a wide jurisdiction in matters such as shipping, bankruptcy, company winding-up, workmen's compensation, custody and adoption of children, etc., but it has no jurisdiction in question of status (divorce, declarator of marriage, legitimacy). Appeal lies from the sheriff substitute either direct to the Court of Session or to the sheriff principal and then to the Court of Session.

COURT OF SESSION.—This is the supreme civil court within Scotland. It consists of an Outer House and an Inner House. The Outer House is a court of first instance and is comprised of Lords Ordinary, one of whom holds the court. Apart from certain special forms of action which must go in the first instance to the Inner House, the Inner House is a court of appeal, hearing appeals from the Sheriff Court and the Outer House. The Inner House consists of two divisions of equal status, the First Division, presided over by the Lord President (head of the whole Court of Session), and the Second Division, presided over by the Lord Justice-Clerk.

HOUSE OF LORDS.—Appeals may be taken from the Inner House of the Court of Session to the House of Lords.

CRIMINAL COURTS

SESSIONS OF THE PEACE (J.P. COURT).—This court has only a minor jurisdiction in breach of the peace, assault, petty theft, etc. It cannot impose fines of more than £10 nor sentences of imprisonment of more than sixty days.

BURGH POLICE COURT.—The jurisdiction here is confined to offences under the Burgh Police Acts and such other offences as magistrates are entitled to try. Limits of fines and imprisonment are the same as for the J.P. Court.

SHERIFF COURT.—In addition to its civil jurisdiction, the Sheriff Court has also a criminal jurisdiction.

(a) In Summary Prosecutions (i.e. for the less serious crimes) the Sheriff sits without a jury and can impose fines up to £25, or sentences of imprisonment up to six months with or without hard labour. In such cases an appeal can be taken to the High Court on questions of law, and either side can appeal.

(b) In Prosecutions on Indictment, which is the procedure for more serious crimes, the Sheriff sits with a jury and can give sentence of imprisonment, with or without hard labour, up to two years. The accused may appeal to the High Court on both fact and law, and he can also appeal against the sentence.

In both the J.P. Courts and the Burgh Police Courts, the bench is composed of laymen, but it will have been noticed that the jurisdiction of these Courts is restricted to comparatively minor offences. In the Sheriff Court, however, the position is different: it is true that there are a good many judges (honorary Sheriff's-substitutes), but their functions are generally exercised in more formal or less serious matters. The great bulk of the criminal jurisdiction of the Sheriff Court is exercised by the Sheriff-substitute, who is a trained lawyer.

HIGH COURT OF JUSTICIARY.—This court, popularly known as the High Court, is the supreme criminal court in Scotland. It alone has jurisdiction in the crimes of rape and murder, and it alone can sentence to death or penal servitude. It is the only court in Scotland that goes on circuit. The president is the Lord Justice-General (who is also president of the First Division of the Court of Session) and the vice-president is the Lord Justice-Clerk (who also presides over the Second Division of the Court of Session). The High Court has always been a court of appeal from the inferior criminal courts.

CRIMINAL APPEAL COURT.—This court was established only as recently as 1926, and made provision for the first time for hearing appeals from convictions on indictment either in the High Court or in the Sheriff Court. The court consists of at least three judges. Appeals lie against conviction as of right on any question of law and, by leave, on grounds involving a question of fact or on any other grounds which the court or the trial judge may deem sufficient. Appeals lie by leave against sentence only. The court may quash a conviction or reduce a sentence. It also possesses power to increase a sentence.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE HOUSEHOLD COOKERY BOOK

Here you will find practical recipes of every kind for daily use as well as a great variety of new dishes, with simple instructions which can be as easily followed by the beginner as by the experienced cook

ANCHOVY BUTTER.—2 oz. butter or fresh margarine, a few grains cayenne, 1 teaspoonful anchovy essence.

Beat the butter or margarine to a soft cream; add the cayenne and the anchovy essence gradually, working it with a wooden spoon until evenly coloured.

This savoury butter makes appetizing sandwiches. Spread on thin slices of brown or white bread and add a layer of shredded lettuce or cress or cucumber thinly sliced.

It is also very good if patted into small balls and served with grilled fish.

ANCHOVY EGGS.—4 eggs, ½ teaspoonful anchovy essence, 1 dessertspoonful mayonnaise or salad cream.

Boil the eggs for 10 minutes, put them in cold water and, when they are quite cold, remove the shells and cut the eggs across in halves. Take out the yolks carefully, put them in a small basin and mix with them the anchovy essence and mayonnaise or salad cream. Put this paste into the whites of the eggs and serve them in a nest of small salad.

ANCHOVY SAUCE.—½ pint white sauce (see White Sauce), 1 good teaspoonful anchovy essence.

Make the white sauce, add the anchovy essence and stir until evenly mixed. Serve very hot.

ANCHOVY SAVOURIES.—4 oz. flour, pinch of salt, 2 oz. fresh margarine, 1 or 2 tablespoonsful milk, 1 tablespoonful grated cheese, 4 oz. soft cream cheese, 1 teaspoonful anchovy essence.

Gas Regulo Mark 3, Electricity 350° F.

Mix a good pinch of salt with the flour, rub in the margarine and add a little milk to form a soft but not sticky dough. Roll it out lightly and sprinkle on it evenly the very finely grated cheese. Fold the pastry over the cheese and roll out again. Then cut into small square or oblong biscuits and bake in a very moderate oven until they are a light fawn, which takes about 15 minutes.

Leave until cold and then put them together in pairs with a layer of cream cheese between, which has been mixed with anchovy essence to colour it pink.

APPLE-AND-LEMON JELLY.—4 lb. sharp cooking apples, 1 lemon, 2 quarts water, 1 lb. sugar to every pint of liquid.

Wash the apples and see they are quite sound; cut them in pieces but do not peel or core them. Put them in a preserving pan with the water and let them simmer until quite soft. Do not stir them. Put a hair sieve in a bowl, turn the apples and juice on the sieve and leave them until the juice has ceased to drip, but do not press them or the jelly will be cloudy. Pare off the yellow part only of the lemon rind and strain the juice.

Measure the apple juice and put it in a preserving pan with 1 lb. of sugar for every pint of juice; add the strained lemon juice and the rind. Stir over gentle heat until the sugar has dissolved, then bring to the boil. Take out the rind and boil until the jelly sets when tested. Remove any scum, turn into warm dry jars and tie down when cold.

If you like a pink jelly, use rosy-cheeked apples or add a few drops of carmine.

APPLE-AND-RAISIN PUDDING.—2 oz. stoneless raisins, 1 lb. apples, 2 oz. granulated sugar, 2 oz. margarine, 1 lemon, 1½ tablespoonsful flour, 1 breakfastcupful breadcrumbs, 1 egg.

Well grease a basin and line it with the raisins, placing them in rows. Peel, core and slice the apples and stew them until soft with just a little water. Mix with them the sugar and margarine and stir until the fat has melted. Then add the flour, breadcrumbs, grated rind and juice of the lemon. Mix with a well beaten egg.

Steam for one hour. Turn out carefully.

Boiled custard is very good with this pudding.

APPLE CHARLOTTE.—1 lb. cooking apples, 1 lemon, 2 oz. margarine, 2 oz. Demerara sugar, 1 breakfastcupful fine breadcrumbs.

Gas Regulo Mark 6, Electricity 425° F.

Peel and core the apples and grate them coarsely on a vegetable grater. Grate the yellow part of the lemon rind only, strain the juice, mix the grated rind with the breadcrumbs, add the sugar and lemon juice. Turn this mixture into a well

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

greased pie dish. Then put the margarine on top in small pieces and bake until the charlotte is brown.

APPLE DUMPLINGS (Baked).—½ lb. self-raising flour, ¼ lb. margarine, 2 oz. lard, a good pinch of salt, milk to mix, 4 cooking apples medium size.

Gas Regulo Mark 7, Electricity 450° F.

For filling.—A little butter and sugar, a few cloves or stoned raisins, or golden syrup or honey and chopped nuts.

Add the salt to the flour and sift them. Next rub in the margarine and lard lightly, with the tips of the fingers, until the mixture has the appearance of fine breadcrumbs and there is no plain flour remaining.

Now add a little milk gradually until it forms a soft dough. Be careful not to add too much milk, as the dough must not be at all sticky. Roll the paste out on a floured board and cut it into rounds—a cheese plate is a good guide from which to cut.

Peel and core the apples and fill the centres with whichever filling you prefer. Place an apple on each round of pastry, draw up the pastry to the centre, wet the edges with cold water and press them on the apple. Make a nice shape. Turn the dumplings over, place them on a fireproof dish and bake in a moderate oven. Be sure to use cooking apples, otherwise they will not be soft when the pastry is done. To test the dumplings, stick in a thin skewer.

APPLE DUMPLINGS (Steamed).—1 lb. self-raising flour, ½ teaspoonful salt, 4 oz. suet, 1 lb. medium-sized cooking apples, essence of cloves or grated lemon rind, 2 tablespoonsful Demerara sugar, 1 oz. margarine.

Peel and core the apples. Mix the margarine with the sugar and the lemon rind or clove essence.

Sift the flour and salt; shred the suet very finely. Mix it with the flour and form a soft dough with skimmed milk or water.

Roll out the pastry and cut it in rounds.

Fill the centres of the apples with the margarine and sugar mixture. Cover as described for baked apple dumplings. Tie each one in a cloth and steam for one hour.

Serve with custard sauce or mock cream.

APPLE FRITTERS.—2 large cooking apples, 2 oz. granulated sugar, 4 oz. flour, a good pinch of salt, ½ oz. butter, 1 gill milk, 1 egg, fat for frying, juice of lemon.

Peel the apples and scoop out the cores. Cut the apples across in slices, put them on a dish, sprinkle the sugar and strained lemon juice over them and leave for one hour, or more if the apples are hard.

Sift the flour, mix a good pinch of salt with it, add the well-whipped egg, the warmed butter, and the milk. Beat well the whole time you are adding these ingredients. This batter should be thicker than pancake batter—thick enough to drop, but not pour, from a spoon.

Put the apple rings into the batter. See that the fat is boiling in your pan, take out each apple ring separately and drop them into the fat. Fry a golden brown, drain well and sprinkle with sugar.

APPLE LAYER PUDDING.—½ lb. self-raising flour, a pinch salt, 4 oz. margarine, a teacupful skimmed milk, 2 large cooking apples, 1 oz. sugar, ½ lb. dates, 2 tablespoonsful lemon or orange juice.

Rub the margarine into the flour, add the salt and just enough skimmed milk or milk and water to form a rather soft dough. Roll it out rather thinly. Grease a basin, cut about one-third of the dough into a round (a plate can be used as a guide) and line the basin with it, peel, core and slice one of the apples and put it on the pastry. Sprinkle with sugar, then add a layer of dates, stoned and chopped, and sprinkle these with lemon or orange juice. Cover with a second portion of the pastry and repeat the layers of fruit and sugar. Cover with the remainder of the pastry. Tie a piece of greaseproof paper over the basin and steam for three hours. Turn out and sift a little sugar over before serving.

APPLE MERINGUE.—1 lb. apples, 1 teacupful breadcrumbs, ¾ breakfastcupful milk, 1 egg, 3 oz. castor sugar, 1 oz. Demerara sugar, 2 level tablespoonsful lemon curd.

Gas Regulo Mark 3, Electricity 350° F.

Peel, core and cut up the apples, stew them to a soft pulp with the Demerara sugar and two tablespoonsful of water. Put them in a pie dish and cover with the breadcrumbs. Beat the yolk of the egg with 1 oz. of castor sugar, add the milk and pour them over the breadcrumbs. Bake in a slow oven until set. Leave until cool. Then add a layer of lemon curd, spreading it on evenly.

Whip the white of the egg to a stiff froth, gently fold in the remainder of the castor sugar. File this on the pudding and bake till golden brown.

APPLE PUDDING (Baked).—1 lb. cooking apples, 1 breakfastcupful breadcrumbs, 2 oz. Demerara sugar, 1 pint custard.

Gas Regulo Mark 5, Electricity 400° F.

Peel, core and cut in pieces the apples.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cook them gently to a pulp. Grease a pie dish, put in a layer of stewed apples, cover with breadcrumbs, sprinkle with Demerara sugar, repeat the layers until the apple is used—put a layer of breadcrumbs on the top, and pour in 1 pint of custard made with custard powder. Bake in a moderate oven until nicely browned. Serve hot or cold.

APPLE PUDDING, GOLDEN.—1 lb. cooking apples, 1 oz. sugar, slices of bread and margarine, 2 tablespoonsful golden syrup, 1 oz. butter, 1 cupful breadcrumbs.

Gas Regulo Mark 5, Electricity 400° F.

Peel, core and cut in pieces the apples. Put them in a saucepan with 2 tablespoonsful of water and the sugar and stew gently until quite soft. Stir them now and then to prevent burning. Beat to a smooth paste and leave until cool.

Spread very thin slices of bread with margarine and use them to line a pie dish. Cover them with a good layer of golden syrup.

Spread over the syrup half the apple pulp, cover with fine breadcrumbs, then another layer of apple pulp and a final cover of breadcrumbs.

Put 1 oz. of margarine or butter in small pieces on the top and bake a golden brown.

APPLE PUDDING (Steamed).—½ lb. suet or short pastry, 1 lb. cooking apples, 1 oz. sugar, 6 cloves or 1 teaspoonful grated orange or lemon rind.

Well grease a basin and line it with about three-quarters of the pastry, reserving just sufficient to cover the top.

Put in a layer of peeled and cored apples, then a sprinkling of sugar, a little lemon rind or cloves, repeat the layers until the basin is full.

Roll out and place the reserved piece of pastry on the top and fold in the edges of the lining pastry. Cover with greaseproof paper and a cloth and steam for three hours.

Golden syrup diluted with a little hot water and flavoured with lemon juice makes a good sauce for this pudding.

APPLE SAUCE (To serve with duck, goose or pork).—½ lb. cooking apples, 1 dessertspoonful sugar, 1 teaspoonful butter (optional).

Peel, core and cut the apples in pieces, do not slice them, put them in a small saucepan or a pie dish if the oven is in use.

Sprinkle them with the sugar. Add 2 tablespoonsful of hot water and cook gently until they are a soft pulp. Beat till smooth, adding butter as you beat.

APPLES, BAKED.—6 cooking apples, 6 cloves or grated lemon rind, 1 oz. butter, 2 oz. sugar.

Gas Regulo Mark 5, Electricity 400° F.

Wash and core the apples, and just cut through the skin round each one—to prevent them bursting. Put them in a baking dish with about 1 tablespoonful of water. In the centre of each apple put a clove or a little grated lemon rind. Bake in a moderate oven until soft. A few minutes before serving fill the centre with sugar and put a scrap of butter in each.

APPLE SNOW WITH CUSTARD.—For the snow: 3 large cooking apples, ¼ lb. castor sugar, the white of an egg, juice of ½ a lemon. For the custard: ¾ pint of milk, 1 oz. castor sugar, 1 level dessertspoonful cornflour, ½ teaspoonful lemon or vanilla essence, the yolk of the egg.

Peel, core and cut up the apples. Stew them gently to a pulp with the lemon juice and 1 tablespoonful of water. Beat until quite smooth, add the sugar and, when cold, the beaten white of a large, fresh egg. Whip briskly until the mixture is a stiff, white cream. For this the egg should be new laid and, if small, the whites of two will be needed.

To make the custard: Mix the cornflour to a thin paste with a little of the milk, put the remainder in a saucepan, and when it boils pour it slowly on the cornflour.

Return it to saucepan, add the sugar and stir while it boils for 5 minutes. Beat the yolk well, and pour the hot cornflour upon it, stir in the vanilla, stir for a few moments so that it is evenly distributed.

Let it get quite cold before pouring it gently round the snow, and serve at once.

Or the apple snow may be served garnished with jam instead of the custard.

APRICOT-AND-RICE PUDDING.—2 oz. dried apricots, 1½ pints milk, 2 tablespoonsful rice, 3 oz. castor sugar, 1 egg, 1 oz. margarine.

Gas Regulo Mark 3, Electricity 350° F.

Soak the apricots overnight in sufficient water to cover them and stew gently until tender. Melt the margarine in a saucepan, add the milk, rice and 1 oz. of sugar. Simmer gently until the rice is tender and the mixture thick and creamy.

Drain off any liquid from the apricots and put the fruit in a pie dish. Well whip the yolk of an egg and add it to the creamed rice; spread this on the apricots. Bake for 10 minutes in a very moderate oven. Whip the white of the egg until stiff and dry; lightly fold in 2 oz. of castor sugar. Pile this roughly on the pudding,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

return it to the oven and continue to bake until it is a pale fawn. This is equally good hot or cold.

APRICOT JAM.—1 lb. dried apricots, 3½ lb. sugar, 2 quarts water, 1 lemon.

Wash the apricots, cut them in quarters and put them in a bowl. Boil the water, leave it until cold, then pour it over the apricots and leave for 24 hours.

Grate off the yellow part of the lemon rind and strain the juice.

Next day turn the apricots and the water in which they were soaked into a preserving pan. Boil gently until the fruit is tender. Add the sugar, the lemon rind and juice and continue boiling until it sets when tested—about three-quarters of an hour. Turn into warm, dry jars and cover.

APRICOT PUDDING.—2 breakfastcupsful stale breadcrumbs, 1 pint milk, 2 oz. granulated sugar, 1 oz. margarine, 2 oz. dried apricots, 1 egg.

Gas Regulo Mark 4, Electricity 375° F.

Wash the apricots, cut them in small pieces and soak them overnight in just enough water to cover them. Then stew them gently with 1 oz. of sugar until they are quite soft and there is very little liquid left. Put the breadcrumbs into a bowl and pour over them 1 pint of boiling milk. Beat until smooth, add the margarine, remainder of the sugar and a well-beaten egg.

Put the apricots into a pie dish, cover with the mixture and bake three-quarters of an hour in a moderate oven.

APRICOT TART.—¼ lb. short pastry, 2 oz. dried apricots, 2 oz. loaf sugar, the rind of a lemon.

Gas Regulo Mark 6, Electricity 425° F.

Soak the apricots for 24 hours in enough water to cover them.

Rub the yellow part of the lemon rind on the loaf sugar. Put it in a saucepan with the apricots and the water they were soaked in, and stew to a pulp. Leave till cold.

Roll out the pastry and use it to line a deep plate or sandwich tin that has been well greased, keeping back a little for decoration. Put in the apricot pulp and decorate with narrow, twisted strips of pastry. Bake in a moderate oven for about 20 minutes.

ARTICHOKES, BOILED.—2 lb. artichokes, 1 teaspoonful salt, 1 dessertspoonful vinegar.

Put the vinegar into a bowl of cold water. Wash the artichokes well, then peel and put each one into the water as soon as it is peeled, to keep it white. Cook them in boiling water with the salt and boil until they are quite soft—about half an hour.

Drain well, turn into a hot tureen and cover with white sauce.

ARTICHOKES, FRIED. — 1 lb. artichokes, 1 tablespoonful flour, 1 egg, fine breadcrumbs, salt and pepper, anchovy sauce, fat for frying.

Prepare and boil the artichokes as directed in the previous recipe, but strain them before they are very soft; they need to be rather firm. Drain them well and leave until cold; then flour them, dip in egg, then in breadcrumbs seasoned with salt and pepper, and fry until nicely browned in smoking fat. If served with anchovy or shrimp sauce, they very much resemble fish; or served with fried bacon they make a good breakfast dish.

ASPARAGUS needs careful cooking to ensure that the edible part is not overcooked.

Cut the stalks all one length, then scrape the white part of the stalks, being careful not to break the heads. Tie it in bundles with all the stalks at one end and let them lie in cold water until you are ready to cook it.

Put carefully in boiling water, standing the bunches upright if the saucepan is deep enough, or in a fish kettle on a drainer. Boil gently until the green part is tender—about 20 minutes—then lift out carefully, and remove the tape and place in a tureen with a strainer underneath. Serve liquid butter separately.

BACON.—Choose bacon with lean of a fine grain and rather a bright pink in colour. The fat should be very white and firm. When it is yellow the bacon is stale. Middle gammon and back are prime parts either for boiling in the piece or to cut in rashers for grilling.

Collar is cheaper and also a good joint for both purposes.

The knuckle is not profitable, for though cheap, it has a great deal of bone and is usually salt.

To Boil.—Wash the bacon and put it in cold water. Bring to the boil quickly, remove any scum and simmer gently until done, allowing half an hour to every pound. When cooked sufficiently the rind should come off quite easily.

When it has been removed, sift fine bread raspings over the fat side before serving.

If the bacon is to be eaten cold, leave it until cold in the water; this prevents it from becoming dry. Then remove rind.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BACON AND BATTER.—½ lb. rashers bacon, 2 tablespoonsful cornflour, 1 level tablespoonful flour, ½ pint milk, 1 egg, small teaspoonful baking powder, salt and pepper.

Mix the flour and cornflour together; add the baking powder and a good seasoning of salt and pepper. Beat the egg well and mix it with the milk. Stir it into the dry ingredients, mixing thoroughly.

Fry the bacon and keep it hot. Turn the mixture into the bacon fat and fry a golden brown on both sides.

Serve surrounded by the rashers.

BACON BREAKFAST-CAKES. — These cakes are very good and they make a little bacon go a long way. 1 rasher bacon, 1 egg, 1 breakfastcupful mashed potatoes, 1 breakfastcupful cooked root vegetables cut in dice, 1 oz. dripping or lard, salt, pepper, mustard, 1 dessertspoonful flour.

Either long back or streaky bacon may be used. Remove any rind and chop it very finely. Mix it evenly with the mashed potato and add the diced vegetables. Season with salt, pepper and a little made mustard or the liquor from a thick pickle.

Beat the egg well and use it to bind the mixture. With a little flour form it into six round flat cakes and fry in hot fat until nicely browned.

BACON DUMPLINGS.—6 oz. flour, 4 oz. cooked fat bacon, 4 oz. mashed potatoes, 1 teaspoonful chopped parsley, 1 finely chopped onion, a little pepper and salt, the grated rind of ½ lemon, a little milk for mixing.

Chop the bacon finely, add it to the rest of the dry ingredients and with the milk mix all to a firm, smooth paste. Divide them into 8 portions, and make each into a ball; roll them in flour, put them into a saucepan of boiling water and boil gently for 20 minutes.

If cooked in water serve them with tomato sauce or a good thick gravy; or they may be cooked with boiled meat, putting them in 20 minutes before the meat is done.

BACON IN POTATO CASES.—4 large potatoes, 2 oz. fat cooked bacon, 2 tablespoonsful milk, pepper, salt and cayenne.

Gas Regulo Mark 7, Electricity 450° F.

Scrub the potatoes clean and bake them in a moderate oven until soft. Take them out and cut them in halves lengthwise. Scoop out the insides without breaking the skins, and mash the potato smoothly. Have the bacon minced finely, mix it with the potato and milk and season it well. Put the mixture back into the skins, smooth the tops over and put the potatoes back into a hot oven for about 10 minutes to get thoroughly hot.

BACON ROLY-POLY PUDDING.—½ lb. suet pastry, ½ lb. thin bacon rashers, ½ lb. onions, 1 teacupful finely chopped parsley, 1 lb. carrots, 1 lb. parsnips.

Roll out the pastry, cover it with the slices of bacon and then with the onions peeled and finely chopped. Scatter over the parsley and just sprinkle it with a few teaspoonsful of water.

Roll up firmly like a roly-poly, tuck in the ends and cover tightly with a cloth fastened securely. Put into boiling water and boil for 3 hours.

Prepare the vegetables and cook them round the pudding, putting them in 1½ hours before the pudding is cooked.

BACON SCALLOPED WITH POTATOES.—1 rather thick gammon rasher, ¾ pint milk, 1 lb. potatoes, 1 small onion, scrap of butter, pepper.

Gas Regulo Mark 4, Electricity 375° F.

Remove the rind and fry or grill the bacon lightly on both sides.

Butter a pie dish or casserole and put the bacon in it.

Peel and slice the potatoes; peel and mince the onion very finely. Put the potatoes in layers on the bacon with the minced onion distributed among them. Sprinkle the layers with pepper. Pour in the milk gently. Cover and bake in a very moderate oven for 1 hour. Then remove the cover and bake half an hour longer until nicely browned.

BACON SUPPER-SAVOURIES. — ¼ lb. bacon rashers, 1 teacupful mashed potatoes, 1 teaspoonful made mustard, 1 teaspoonful liquid from thick pickle or a few grains cayenne, ¼ lb. short pastry, 1 oz. butter.

Gas Regulo Mark 6, Electricity 425° F.

Choose lean bacon, remove any rind, mince the bacon finely and mix it with the potato. Add the mustard, cayenne or pickle. Melt the butter and stir it in.

Roll out the pastry in an oblong shape, spread the mixture on it and roll like a jam roll. Cut into slices about 1 inch thick and bake in a hot oven for about 15 minutes.

BAKED-BEANS-AND-TOMATO PUDDING.—1 tin baked beans and tomato sauce, ¼ lb. rashers bacon, 1 shallot, 1 tablespoonful milk, 1 lb. potatoes, 1 oz. margarine, 1 tablespoonful tomato ketchup.

Gas Regulo Mark 7, Electricity 450° F.

Peel and boil the potatoes and rub them

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

through a sieve. Beat them smooth, adding the milk, a sprinkling of salt and pepper.

Remove the rind and grill the bacon lightly. Peel and chop the shallot very finely. Grease a pie dish.

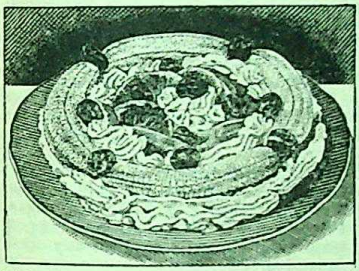
Line it with half the mashed potatoes, put in the rashers of bacon cut in small pieces, the shallot very finely shredded and cover the last layer with the beans and their sauce.

Mix the ketchup with the remainder of the mashed potato and cover the beans with this, roughing it with a fork. Put some scraps of margarine on the top and bake for half an hour in a hot oven. Serve hot in pie dish.

BANANA GATEAU.—A sponge sandwich, 4 bananas, 2 oranges, 2 tablespoonsful of castor sugar, whipped cream, a few glacé cherries.

Mash 2 bananas, moisten them with the juice of half an orange mixed with a tablespoonful of castor sugar, and use this mixture as a filling for the sponge sandwich.

Now cut the remaining bananas in halves lengthwise and arrange them round the



If bananas are used in this way they make a very appetizing and delicious sweet

sandwich. Divide an orange into sections, removing pith and pips and put them in the centre. Sprinkle over all the juice of half an orange mixed with the remainder of the sugar. Decorate with a piping of whipped cream and the glacé cherries.

BARLEY WATER. — 2 tablespoonsful pearl barley, 2 cupsful boiling water, sugar to taste, the rind and juice of ½ lemon.

Wash the barley well and put it into a jug. Pour the boiling water over. Then add the rind and juice of half a lemon and sugar to taste, cover the jug and let it stand until the contents are quite cold, then strain and it is ready for use.

BEAN MOULD.—½ lb. haricot beans, 1 tablespoonful breadcrumbs, 1 oz. butter, 1 egg, ½ lb. ripe tomatoes or 1 tin tomatoes, salt, pepper.

Boil the beans until they are quite soft, then rub them through a sieve. If fresh tomatoes are used, stew them gently until soft. Add a good seasoning of salt and pepper to the beans and the butter warmed. Well whip the egg and beat it in. Well grease a pudding basin and coat it inside with the breadcrumbs. Turn in the haricot mixture and bake in a moderate oven until firm to the touch.

Rub the tomatoes through a sieve and season them with salt and pepper. Make them very hot. Turn out the mould and pour the hot tomato over.

BEANS, DWARF OR RUNNER. — Dwarf beans, also called French beans, may be cooked whole when quite young, but when fully grown the stringy edge must be removed and the beans sliced.

Runner beans are prepared in the same way.

Put them into boiling water with a little salt and boil quickly for 15 to 20 minutes.

Beans are greatly improved by being tossed in a little hot butter, pepper and salt before they are served.

BEEF.—Choose beef with bright-red lean and creamy-white fat—the suet firm and hard. If there is a wide streak of gristle between the fat and the lean, it will be tough, for it is not young. Choose it also with a fair amount of fat, for lean beef lacks flavour.

BEEF CASSEROLE WITH MACARONI.—1 lb. buttock steak, 2 tomatoes, 1 head celery, 2 oz. macaroni, 1 small onion, pepper and salt, 1 oz. dripping.

Gas Regulo Mark 4, Electricity 375° F.

Cook the macaroni in boiling water with a little salt until it is quite tender. Then drain it. Cut the meat, celery and onion into neat pieces, and fry them brown in a little dripping. Put them into a casserole. Add the tomatoes cut in slices, the cooked macaroni, little pepper and salt, and ½ pint water from the macaroni. Put the lid on the casserole and cook in a moderate oven for at least 2 hours. When tender, serve very hot in the casserole.

BEEF, SALT.—Joint of silverside, round or brisket, 1½ lb. large carrots, 1 lb. onions, 1 lb. turnips, a clove, small bunch fresh herbs.

Wash the meat and tie it into shape; put it in a stewpan with enough cold water to cover it. Bring to the boil, remove any scum, add the carrots scraped

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and cut in quarters, the clove stuck in a small onion, a good sprinkling of pepper and the herbs. Then simmer very gently until the meat is very tender. Prepare the turnips and onions and add them when the meat is half done. A stick of celery cut into small strips is also very good when available.

If dumplings are to be served with the meat, add them 20 minutes before the meat is ready. Serve the meat very hot with the vegetables round and some of the broth in a tureen.

BEEF, to Roast.—The best joints for roasting are the sirloin, ribs or round. The aitchbone is sometimes roasted but it needs to be well hung, as it is inclined to be tough.

Gas Regulo Mark 8, Electricity 475° F.

When the joint is nicely browned, reduce gas regulo to mark 4 or electricity temperature to 375°.

Baste several times during the cooking. Beef should never be overcooked. Allow a quarter of an hour for each 1 lb., and 20 minutes over. When done, place it on a hot dish, removing skewers or string, and keep it hot.

To make gravy, slowly pour off the fat from the tin, being careful to leave behind all the brown sediment, which is the essence of the meat. Sprinkle in a little salt and add ½ pint of boiling water or broth from a beef bone, place over gentle heat and stir well, scraping all the brown particles from the bottom of the tin. Strain into a hot tureen and serve at once.

Yorkshire pudding and horseradish sauce are the accompaniments to roast beef. Onions, too, are very good. Parboil them, drain as dry as possible, and put them in the hot fat when the joint is half cooked.

BEETROOT, BAKED. — Choose some beetroots that are young and tender. Wash them very carefully in cold water. Avoid breaking the skins or else the colour of the beetroots will be ruined. Put them on a baking tin and bake in a slow oven. Cooked in this way the skin is less likely to break than when boiling, and they also retain their full flavour.

Gas Regulo Mark 4, Electricity 375° F.

Beetroot Served Hot.—Choose young, tender beetroots. Wash them very carefully so as not to break the skin. Put them in boiling water and cook until tender—1 to 2 hours according to their size. Peel them and cut in slices or cubes. Cover with white sauce and serve very hot.

Or, if preferred, melt 1 oz. butter in a saucepan, adding a sprinkling of salt and pepper. Toss beetroot into this and serve.

BISCUITS. Afternoon Tea Biscuits.—½ lb. flour, ½ teaspoonful baking powder, 2 oz. margarine, 1 oz. lard, 2 oz. sugar, ½ teaspoonful powdered cinnamon, 1 oz. currants, 1 egg, a pinch of salt.

Gas Regulo Mark 4, Electricity 375° F.

Mix together flour, baking powder and salt and put them through a sieve. Rub in the fats and add the sugar, cinnamon and currants. Mix to a stiff dough with beaten egg, roll out thinly, cut in rounds with a fluted cutter and bake in a moderate oven for a quarter of an hour.

BISCUITS, Orange or Lemon.—½ lb. flour, 3 oz. margarine, 4 oz. castor sugar, 1 small teaspoonful baking powder, the finely grated rind of an orange or lemon, 1 egg (or dried egg), a pinch of salt.

Gas Regulo Mark 6, Electricity 425° F.

Mix flour, baking powder and salt together. Beat margarine and sugar to a soft cream. Add well-whipped egg very gradually, beating all the time, then the grated rind. Now add the flour mixture to form a soft dough. Roll out on a floured board, cut into shapes and bake in a rather quick oven for 15 minutes.

BISCUITS, Plain.—6 oz. self-raising flour, 2 oz. margarine or lard, 1 oz. sugar, skimmed milk to mix.

Gas Regulo Mark 4, Electricity 375° F.

Rub the fat into the flour until evenly mixed, add the sugar and just enough milk to form a rather soft dough. Roll out rather thinly, cut in rounds and bake in a moderate oven 10 to 15 minutes.

BISCUITS, Wholemeal.—½ lb. wholemeal flour, small teaspoonful baking powder, 2 oz. margarine, 1 oz. lard, 2 oz. sugar, 1 tablespoonful golden syrup, 1 egg, ½ teaspoonful almond essence or any other flavouring.

Gas Regulo Mark 4, Electricity 375° F.

Mix the flour and baking powder, rub in the fats, stir in the sugar. Beat the egg, syrup and essence together and add them gradually to the dry ingredients. If the mixture is at all sticky work in a little more flour. Roll out until quite thin. Cut into biscuits and bake until crisp.

BLACKBERRIES IN TOAST. — Thin slices of bread, about 1 oz. butter, ½ lb. ripe blackberries, 3 oz. sugar.

Gas Regulo Mark 5, Electricity 400° F.

Toast some thin slices of bread and butter them generously, and with them line the bottom and the sides of a pie dish, making them fit neatly. Fill the space with ripe blackberries, sifting plenty of sugar amongst them. Cover them with a piece of well-buttered toast and bake

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in a moderate oven for about half an hour.

Turn out when cold, sift sugar over and serve with custard.

BLACKBERRY - AND - APPLE JAM.—2 lb. cooking apples, 4 lb. blackberries, 1 pint water, ¾ lb. sugar to each pint of prepared fruit.

Peel, core and quarter the apples, put them in a jar and place the jar in a preserving pan half-full of cold water. Heat the water gradually, then let it boil gently until the apples in the jar are quite soft.

Put the blackberries in a stewpan with a pint of water and simmer gently to a pulp. Then rub through a hair sieve which is fine enough to keep back all the seeds.

Mix this purée with the cooked apples. Measure the fruit, put it into a preserving pan with ¾ lb. of sugar to every pint, and simmer until it sets when tested—about half an hour.

BLACKBERRY AND RICE CUSTARD. ¾ pint milk, 3 oz. sugar, 2 tablespoonsful rice, 1 egg, 1 oz. margarine, ½ lb. ripe blackberries.

Gas Regulo Mark 4, Electricity 375° F.

Put 2 oz. of sugar and a teacupful of water into a saucepan, stir until the sugar has melted, then boil gently for 5 minutes. Remove any stalks from the blackberries, put them in the syrup and simmer until they are soft. Strain off the syrup.

Put the blackberries into a pie dish and boil the syrup until it is reduced to one-half. Pour it over the blackberries and leave until cold.

Put the margarine in a saucepan and when it has melted add to it the rice, milk and 1 oz. of sugar. Cook very gently until the rice is tender, being careful that it does not stick. Take it off the fire, stir in the well-beaten egg and pour this mixture over the stewed blackberries. Bake for 20 minutes; serve hot or cold.

BLACKBERRY JELLY.—6 lb. blackberries, 3 lb. cooking apples, ¾ lb. preserving sugar to every pint of juice.

Wipe the apples with a cloth, cut them into quarters, but do not peel or core them. Put them in a stewpan, just cover with water and bring to the boil, then simmer until the apples are very tender. Strain off the juice through a fine hair sieve, leaving it to drip overnight; do not press.

The blackberries should be quite ripe. Remove any stalks, put them in a colander and let cold water run over them for a minute, shake them and put them in the stewpan, cover with cold water, bring to the boil and simmer until the blackberries are soft and the water a dark red. Drain off the juice on a fine hair sieve. When the fruits have ceased to drip, mix the two juices together and measure. Put the liquid in a preserving pan with ¾ lb. of sugar to every pint of juice and boil quickly until it sets when tested—about half an hour. Turn into dry, warm jars and tie down.

BLACKBERRY PUDDING, BAKED.—1 lb. blackberries, 4 oz. granulated sugar, 4 oz. flour, pinch of salt, 2 oz. margarine, milk to mix, 1 egg.

Gas Regulo Mark 5. Electricity 400° F.

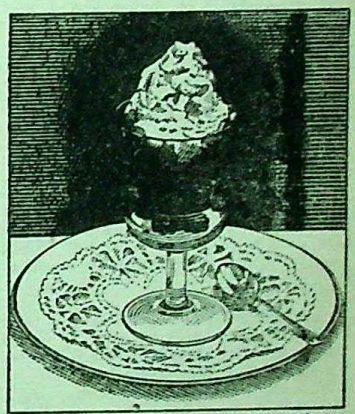
Put the blackberries in a stewpan with 2 oz. of sugar and 2 tablespoonsful of water and simmer until quite soft. Then rub through a sieve that will keep the seeds back.

Return the purée to the saucepan and boil until thick, stirring well. Spread it in a greased pie dish and leave to cool.

Mix the salt with the flour, rub in the margarine; stir in the remaining sugar and the egg. Mix well with enough milk to form a batter that will drop easily from the spoon. Spread this over the blackberry purée and bake for 40 minutes in a moderate oven. Sift a little sugar over and serve hot or cold.

BLACKBERRY PUREE WITH MOCK CREAM.—1 lb. blackberries, ¼ lb. castor sugar, mock cream (see recipes).

The blackberries should be fully ripe. Stalk them, put them in a colander and pour a little warm water over them. Drain and stir them gently until soft. Then rub through a sieve. Add the sugar and mix well. Serve the purée cold in glasses with a generous topping of mock cream.



Serve the blackberry purée cold in glasses with a generous topping of mock cream

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BLACKBERRY SHORTCAKE. — ½ lb. short, sweet pastry, ½ lb. blackberry-and-apple jam, a little whipped cream or custard.

Gas Regulo Mark 7, Electricity 450° F.

Make ordinary short pastry but add a little sugar to the flour and mix it with milk.

Roll out and cut into two rounds. Bake in sandwich tins or on tin plates. Prick the centres with a fork to prevent their rising. When cooked, spread the jam on one round, place the other on the top, serve hot with custard, or cold decorated with whipped cream or icing.

BLACKCURRANT JAM. — 3 lb. ripe blackcurrants, 2 quarts water, 7 lb. sugar.

This method of making jam is the best for blackcurrants, as they are usually expensive and not as plentiful as other small fruits. This will make 10 to 12 lb. of jam with only 3 lb. currants, but they must be good, ripe fruit.

Remove the stalks from the currants, put them in a preserving pan with the water and boil for half an hour. They must boil, not simmer, all the time.

Then add the sugar, dissolve and boil *very* rapidly for 10 minutes. Turn into hot, dry jars and cover at once.

BLACKCURRANT JELLY.—6 lb. ripe blackcurrants, 1 lb. sugar and ¼ pint water to every pint of juice.

Stalk the blackcurrants, put them into stone jars and stand them in a pan half full of boiling water. Let the water boil round them, and, as the juice flows, strain it off into a jug. When the juice has ceased to flow, turn the fruit on to a hair sieve and leave it until it has ceased to drip. Press gently with a spoon to get as much juice as possible. Measure all the juice and put it in a preserving pan with the sugar and water, stirring over gentle heat until the sugar has dissolved. Then boil gently until it sets when tested—20 to 30 minutes. Fill warm, dry jars; cover.

BLACKCURRANT SHAPE.—1 lb. ripe blackcurrants, 2 tablespoonsful cornflour, 3 oz. castor sugar, custard or mock cream. (See Cream, Mock.)

Put the currants in a stewpan, add 1 pint of cold water and the sugar, and stew gently until currants are quite soft. Then rub through a sieve that will keep back all the seeds. Add a little cold water to the cornflour and mix the purée with it. Cook over very gentle heat for 8 minutes, stirring all the time. Turn into a wet mould and leave until quite cold. Turn out and serve decorated with custard or mock cream.

BRAINS.—Calf's brains are generally served with calf's head. Sheep's brains are extremely good fried in the following way: 2 sets sheep's brains, salt and pepper, 1 tablespoonful flour, 1 egg, fine breadcrumbs, fat for frying, ¼ lb. tomatoes, ¼ pint brown stock.

Wash the brains in several salted waters, put them into boiling water with a good pinch of salt, and simmer gently for 20 minutes. Press them between two plates and leave them until they are quite cold. Dry and dust them with flour, then dip in beaten egg and coat with breadcrumbs which have been seasoned with salt and pepper. Fry a golden brown in boiling fat, drain and keep hot. Slice the tomatoes. Pour off every drop of fat from the pan in which the brains were cooked, put in the tomatoes cut in slices, add the stock and a good seasoning of salt and pepper. Simmer for a few minutes and rub through a sieve. Reheat and pour round the brains.

BRAISING.—This is one of the best methods of cooking meat, for it retains all the goodness and tends to make tough meat tender.

A joint of about 3 lb. is a good size for braising; it is also an excellent way of cooking ox tail or steak.

Melt 1 oz. of dripping in a stewpan, sprinkle the meat very sparingly with flour and when the dripping is quite hot put in the meat and brown it on both sides; then add prepared vegetables, carrots, turnips, cut in pieces, onions, a sprig of parsley and thyme, a good sprinkling of salt and pepper and ½ pint stock or water. Cover tightly and cook very gently until the meat is quite tender.

Place on a hot dish with the vegetables round. Skim the fat from the gravy, thicken if preferred and pour it round the meat.

Braising may also be done in a moderate oven

BRAWN.—1 pig's cheek, 1 ear, 1 tongue, 2 large trotters, pinch of powdered mace, a few grains cayenne pepper, salt.

Well wash the meat and put it into a stewpan. Cover with cold water and bring to the boil. Remove any scum, then simmer gently for about 3 hours until the meat will come quite easily from the bones. Cut the meat into neat squares, strain the liquor over them and leave until quite cold, then carefully remove any fat. Put the jelly and meat into a stewpan and season well with mace (cayenne, if liked), salt and pepper. Simmer for 10 minutes, then turn into a mould. Turn out of the stewpan when quite cold and serve with salad.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BRAWN, BEEF.—1 lb. fresh beef pieces, 1 small cow-heel, 1 sprig parsley, pepper and salt, 2 quarts water.

Put the beef pieces and the cow-heel into a saucepan, with the parsley, a little pepper and salt and the cold water. Bring to the boil, remove any scum that rises, and then simmer until the meat will come away from the bones of the cow-heel and the beef is tender. Turn all into a basin, take out the parsley, remove the bones and cut the meat up small. Turn the mixture into a wetted mould. Cover with a plate with a weight on the top, and when cold turn out and serve with salad.

BREAD SAUCE.—To serve with poultry or game. ½ pint milk, 1 small onion, 1 clove, a few grains of mace, 3 peppercorns, breakfastcupful breadcrumbs, ½ oz. butter, salt and pepper.

Peel the onion and stick the clove in it. Put the milk in a saucepan with the onion, mace and peppercorns and heat gradually, then simmer very gently until the milk is well flavoured.

Put the breadcrumbs and a seasoning of salt and pepper in another saucepan and strain the milk on to them. Cover and stand at the side of the stove until the breadcrumbs have absorbed the milk. Add the butter, beat till smooth and make very hot before serving.

BREAD, WHITE.—3½ lb. plain flour, 1 level tablespoonful salt, 1 oz. yeast, 1 dessertspoonful castor sugar, 1½ pints water.

Gas Regulo Mark 7, Electricity 450° F.

Warm all the utensils you are using; this is important for any recipes containing yeast. Mix the flour and salt and sift them into a warm bowl—not too large a bowl, as the flour must be in a heap.

Put the sugar and yeast into a cup and stir them until they are a smooth liquid. Make the water just lukewarm and add it to the yeast and sugar.

With a wooden spoon make a hole in the centre of the flour and pour the liquid into it. Mix a little of the flour round it to make it like a batter. Sprinkle a little of the flour over the batter, leaving the remainder.

Cover the bowl with a cloth and stand it for half an hour in a warm place, out of a draught, to rise. When the yeast has risen through the flour and is all bubbles, mix the remainder of the flour with the batter and turn it on to a board. Knead for 10 to 15 minutes, pressing your knuckles well into the dough. When it is a smooth dough put it back in the bowl, cover with a cloth and leave it for another hour to rise. By then it should have doubled its size. Half fill warm tins with dough and put them in a warm place for a quarter of an hour to "prove." Bake in a hot oven for 10 minutes, then reduce to moderate heat. The bread will need from three-quarters of an hour to an hour.

BREAD, WHOLEMEAL.—1½ lb. wholemeal flour, 1 lb. white flour, 1 oz. yeast, 1 level dessertspoonful castor sugar, 1 tablespoonful salt, 1¾ pints water or milk and water mixed.

Gas Regulo Mark 7. Electricity 450° F.

Mix together evenly the two flours and salt. Put them into a bowl and cream the sugar and yeast as described for white bread. Make half the milk and water lukewarm and mix it with the yeast. Make a hole in the flour and pour the yeast gently in. Mix enough of the dry flour round to form a batter, and cover with a sprinkling of flour. Sprinkle the salt on the dry flour of the "wall" surrounding the batter.

Cover the basin with a cloth and stand in a warm place for one hour, then mix with a wooden spoon, make the remainder of the milk and water lukewarm and add. Knead on a board to a smooth dough, return to the bowl and leave in a warm place for 1½ hours. Half-fill the tins with the dough and leave for 15 minutes in a warm place. Bake as white bread.

BREAD WITHOUT YEAST.—2 lb. plain flour, 1 level tablespoonful baking powder, 1 teaspoonful salt, ¼ pint milk.

Gas Regulo Mark 7, Electricity 450° F.

Mix together the flour, salt and baking powder and put them through a fine sieve. Stir in the milk and add water gradually, but only just sufficient to form a soft, not sticky, dough.

Have ready 2 hot tins, put half of the dough in each and bake immediately in a hot oven.

2 oz. of currants or sultanas can be added to the above to make a fruit loaf.

BROAD BEAN SOUP.—1 breakfastcupful shelled broad beans, 1 pint stock from boiled meat, 1 large onion, small bunch fresh herbs, 1 oz. margarine, ½ oz. flour, ½ pint milk, salt and pepper.

An excellent way to use old broad beans when they are no longer fit to serve as a vegetable.

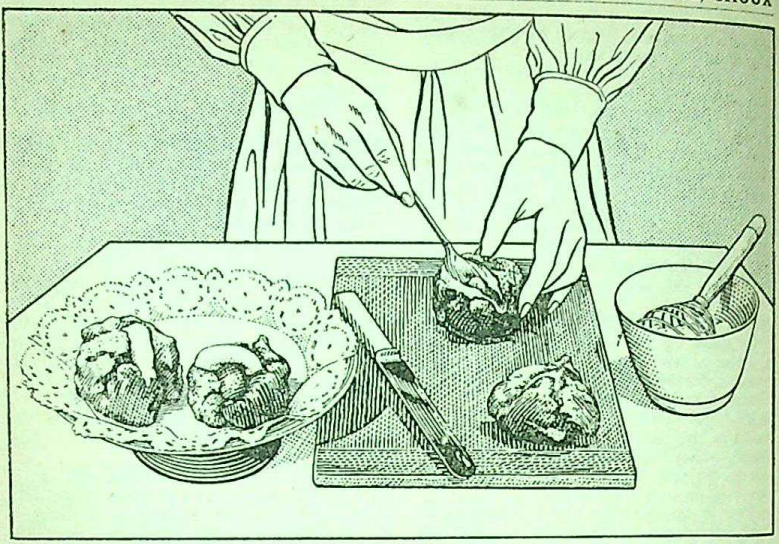
Put the beans in boiling water and boil until tender, strain, cool in cold water and remove the skins.

Put the skinned beans in a stewpan with the onion peeled and sliced, the herbs and stock. Simmer until onion is tender.

Then take out the bunch of herbs and rub beans and stock through a sieve. Re-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



When choux buns are cold they should be filled with cream or custard

turn to the saucepan. Add the margarine, the flour mixed with the milk and season to taste with salt and pepper. Stir while the soup boils for five minutes, then serve.

BROAD BEANS, To Boil.—Broad beans are best when young and not fully grown. Shell and wash them. Cook in boiling water with a teaspoonful of salt, boiling gently until they are quite tender. Strain and turn into a hot tureen. Serve with parsley sauce or mix with them a little hot butter and a good seasoning of salt and pepper.

BRUSSELS SPROUTS, To Boil.—Trim off any outside discoloured leaves and make a slit across the stalk as you would in a cabbage. Put them in cold water for about 20 minutes. Cook in boiling water with a little salt for about 15 minutes. Drain well, press lightly to retain their shape and serve very hot. Sprouts should never be overcooked.

BUCK RABBIT.—For each person: 2 oz. cheese, salt, pepper and mustard, 1 tablespoonful stout, or cream, or milk, 1 egg, 1 square of buttered toast.

Cut the cheese in very thin slices on a vegetable grater, put them into a double saucepan and let the water simmer underneath until the cheese has melted. Then at once add a sprinkling of salt and pepper and a little made mustard.

Now stir in the stout, cream or milk until it is a smooth mixture.

Poach an egg. Spread the cheese mixture on a square of buttered toast, place the egg on the top and serve at once.

BUNS.—½ lb. self-raising flour, 2 oz. sugar, 2 oz. margarine or lard, skimmed milk to mix, flavouring of grated lemon or orange rind, a pinch of salt.

Gas Regulo Mark 7, Electricity 450° F.

Rub the fat into the flour and add the salt and sugar. Mix in the grated rind and form a soft dough with milk. Put small balls of the dough into greased patty pans and bake about 20 minutes in a hot oven.

For fruit buns, proceed as before but add 2 oz. of currants, sultanas or raisins. Make a firm dough with milk. Put the mixture in small pieces on a greased tin, leaving room to spread, and bake in a hot oven.

BUNS, CHOUX.—¼ lb. flour, 1 teaspoonful cornflour, 2 oz. butter or margarine, ¼ pint water, good pinch of salt, 2 eggs.

Gas Regulo Mark 5, Electricity 400° F.

Mix together the flour, cornflour and salt, and sift them. Put the butter in a saucepan with ¼ pint of water and bring to the boil. Then take it off the fire and stir in quickly the flour mixed with the salt and cornflour. Now stir quickly over gentle heat, until the paste is thick and will leave the sides of the saucepan clean.

Remove from the fire, allow to cool for a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

minute or two, then beat in the eggs one at a time; break them into the paste without any beating. When the eggs are beaten in and the mixture is quite smooth, put spoonsful of it into patty pans and bake in a moderate oven for about half an hour. When done, put them on a wire tray or sieve and while still hot make an incision in the centre. Fill with cream or custard when cool.

BUTTER BEAN SOUP.—2 oz. butter beans, 1 onion, 2 oz. dripping, 1 oz. flour, 1 quart seasoned stock, salt and pepper.

Soak the beans overnight in cold water. Then drain and put them into a stewpan with the stock and boil very gently until they are tender—about 1 hour. Peel and chop the onion, and fry it a golden brown in the dripping; sprinkle in the flour, stirring all the time, while the mixture cooks gently for two or three minutes. Rub the beans through a sieve, add them to the flour mixture, and season with salt and pepper, stirring while the stock is mixed in gradually. Bring to the boil and serve.

CABBAGE. — Cabbage should be very fresh; as with all green vegetables, the sooner it is cooked after cutting the better the flavour.

Remove coarse outside leaves, cut in quarters and cut out stalk. Shred leaves across. Cook in a little boiling water with a little salt until tender, drain and press as dry as possible and serve very hot. If cooked cabbage is tossed in a little liquid butter and seasoned with salt and pepper, it is greatly improved.

CABBAGE, PICKLED.—1 red cabbage with hard heart, salt, 1 oz. pickling spice to every quart of vinegar, sufficient vinegar to cover the pickle.

Remove the outer leaves of the cabbage and wash the heart thoroughly; cut into quarters and take away all the hard stalk. Then cut the remainder into fine shreds, spread them out on a dish, sprinkle well with fine salt, using about a heaped tablespoonful for a cabbage of moderate size. Cover with another dish and leave for 24 hours. Then drain well in a colander, and when no more liquid drips from it, fill stone jars with the cabbage.

Put the vinegar in a stewpan with the pickling spice and bring to the boil. Skim well, then cover the pickle with the vinegar when cold and make air-tight.

This pickle is ready for use in a few days. It is not advisable to store it for too long as it is inclined to lose its crispness. Keep well covered with the vinegar.

CABBAGE, STUFFED.—A firm cabbage, 3 tablespoonsful breadcrumbs, ¼ lb. minced cooked meat or sausage meat, 1 shallot, a few sprigs of parsley, 2 rashers fat streaky bacon, 1 tomato, ¼ pint stock. Gas Regulo Mark 5, Electricity 400° F.

Wash the cabbage well, removing all coarse outside leaves and the hardest part of the stalk, making it the right size for your casserole. Boil in salted water for 10 minutes. Take it out and leave it to drain.

Mix together breadcrumbs, meat, finely chopped shallot and parsley. Grill or fry the bacon, cut the rashers in very small scraps and add them to the mixture. Moisten with the liquid fat from the bacon. Open the cabbage sufficiently to put spoonsful of this stuffing between the leaves, tie it round with thin string, and pack it into a casserole. Cook the tomato in the stock and rub it through a sieve. Pour this round the cabbage. Cover closely and bake for 1 hour.

CAKES.—General directions: Have all the ingredients prepared before you begin to mix, especially when the lightness of the cake depends on powders. Weigh quantities and see that flour is dry. Always put it through a sieve to aerate it. Mix with it any powder and ingredients such as spice or salt; they will then be evenly distributed.

Beat fat to a cream unless the recipe directs otherwise, but do not warm it to make it oily. In very cold weather let it be in a warm room for some little while before using.

Never wash dried fruits unless necessary; rub them with a little flour over a sieve. Only use the yellow part of lemon rind in cakes; the white pith gives a bitter taste.

For rich cakes needing long baking, line the tin with two thicknesses of greaseproof paper.

When cakes contain either baking powder or bicarbonate of soda they must be put into the oven as quickly as possible after the milk or eggs have been added, or they will be heavy.

All cakes require a fairly hot oven when they are first put in; then lessen the heat and keep it moderate until the cake is cooked through. If the cake is in danger of becoming too brown before it is done, cover it with greased paper.

Small cakes require a brisk oven, but for shortbread and biscuits the oven should be only moderate. When a skewer inserted into the centre of the cake comes out clean and bright the cake is done. Wait until it has cooled a little, then turn it out carefully on to a sieve or wire cake tray, and when cold put into dry air-tight tins.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The baking of large cakes needs special care. The oven should be hot when the cake is put in, and a steady, moderate heat must be maintained from the time the cake rises until it is cooked through. When it is sufficiently brown, cover with a greased paper to prevent burning.

The chief point is to see that the cake is thoroughly cooked through without getting burnt in the process.

Do not open the oven door more than is absolutely necessary, and never shut it with a bang while a cake is cooking.

Recipes for cakes will be found under their special headings.

CALF'S FEET CASSEROLE.—2 calf's feet, ½ lb. salt pork, 1 level tablespoonful flour, ½ pint milk, pepper, a sprig of thyme and small bunch of parsley.

Thoroughly cleanse the feet and split them, sprinkle them with pepper mixed with the flour, put them in a casserole with the pork cut in small pieces, add the thyme, pour in the milk and add enough water to cover the meat completely.

Cover and simmer slowly for about 2 hours until the meat will come quite easily from the bones. Then skim off the fat and take out the bones. Add a good sprinkling of pepper and the parsley very finely chopped. Simmer for a few minutes and serve very hot.

If any is left over, turn it into a mould and it will set a firm jelly.

CALF'S HEAD.—1 a calf's head, ½ pint white sauce (see Sauces), a lemon, 1 teaspoonful finely chopped parsley, little bunch of herbs, 1 carrot, 1 turnip, 1 onion, 1 teaspoonful vinegar, 1 teaspoonful salt.

Take out the brains and stew them gently for 10 minutes.

Thoroughly clean the head, put it in boiling water with the vinegar and let it remain in the boiling water for 10 minutes. Then take it out and rub it over with cut lemon.

Wrap the head in a piece of muslin and tie it in shape with tape. Put it into a stewpan; well cover with cold water. Bring it slowly to the boil, remove the scum, add the salt, vegetables and herbs and simmer for 2 to 3 hours according to its size. It should be quite tender when ready. Take it out and remove the muslin; place it cheek upwards on a hot dish. Take out the tongue, skin it and serve it with the head.

Chop the brains finely, add them to ½ pint of white sauce and a dessertspoonful of lemon juice and pour this round the tongue. Mask the head with the remainder of the sauce mixed with the chopped parsley.

Serve with boiled bacon or pickled pork and cut lemon.

Parsley sauce may be served round the head instead of brain sauce and the brains reserved for another dish.

CALF'S-HEAD PIE.—An excellent way to utilize the remains of a calf's head. ½ lb. flaky pastry (see Pastry), ½ a cooked calf's head, ¼ lb. streaky bacon, 1 egg, salt, pepper, ½ pint calf's-head broth, 1 dessertspoonful powdered gelatine if the pie is to be eaten cold.

Gas Regulo Mark 8, Electricity 475° F.

Boil the egg for 10 minutes and put it in cold water until wanted. Remove rind from the bacon and grill it very lightly. Cut all the meat from the head in neat cubes. Slice the egg.

Line a pie dish with half the bacon cut in small pieces, then add a layer of the meat, then sliced egg; repeat the layers, seasoning with a little salt and a good sprinkling of pepper. A pinch of finely grated lemon rind can be added if desired. Dissolve gelatine in stock and pour over.

Roll out the pastry and cover the pie with it, making it thicker at the edges, and decorate with pastry cut in leaves or diamonds; brush over with beaten egg (dried egg will do) and bake in a quick oven for half an hour.

CAPER SAUCE.—To white sauce add a dessertspoonful of capers cut in halves, and a teaspoonful of the vinegar. Stir while it simmers for a minute or two, and serve.

CARROTS AND ONIONS WITH HOLLANDAISE SAUCE.—The carrots and onions should be quite small, young ones. 24 young carrots, 24 young onions, ½ pint white sauce, yolk of 1 egg, juice of ½ lemon.

Scrape the carrots and peel the onions. Cook them in salted water until tender, toss them in the sauce and serve very hot.

For the Sauce.—Make ½ pint of ordinary white sauce. Remove the pan from the heat and stir in the beaten yolk of an egg. Stir for 2 or 3 minutes over gentle heat, but do not let the sauce boil after the egg has been added. Drop in the lemon juice gradually, stir until well mixed, and use.

CARROTS, BOILED. — To boil young carrots, wash them well and brush and trim them. Cook them whole in boiling water until quite tender, adding a little salt. Old carrots will need scraping after washing; cut them in quarters, boil until quite tender, allowing about three-quarters of an hour for young carrots and 1½ to 2 hours for old ones, which may be sliced.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CARROT SOUP.—1 quart stock (the liquor from boiled meat or fowl is very good), ½ lb. carrots, 1 large onion, 1 tablespoonful tomato ketchup, 1 oz. butter or margarine, 1 oz. flour, salt and pepper.

Season the stock with salt and pepper if not already seasoned. Scrape the carrots and peel the onion. Cut them in shreds with a vegetable cutter, put them into the stock and simmer until the vegetables are quite tender. Melt the butter, mix the flour with it to a smooth paste, cook for 3 minutes and pour on the stock, add the ketchup, simmer 10 minutes, stirring well, and serve.

CAULIFLOWER, BOILED. — Remove the thick part of the stalk, and the outside leaves, leaving only the small ones round the flower. Cut the stalk across two or three times. Put it in cold water and leave for half an hour before cooking; look it over well for green caterpillars.

Put it in fast boiling water, with a teaspoonful of salt, then boil gently 15 to 20 minutes, until tender, according to size and age.

CAULIFLOWER CARDINAL.—1 large, firm cauliflower, 2 oz. margarine or butter, 1 lb. tomatoes, 1 small onion, salt and pepper, 1 teacupful fine breadcrumbs, 1 tablespoonful flour.

Gas Regulo Mark 6, Electricity 425° F.

Boil the cauliflower until tender, drain it well, put it in a fireproof dish and keep hot.

Wash and stew tomatoes and rub them through a sieve. Put the butter and flour in a small saucepan and stir to a paste over gentle heat. Add the tomatoes gradually and stir to boiling point, until a thick, smooth mixture. Season well with salt and pepper, add the chopped onion and last of all the breadcrumbs. Mix well, pour over the cauliflower and bake 10 minutes in a hot oven.

CAULIFLOWER, CREAMED.—1 cauliflower of medium size, 1 oz. margarine, 1½ gills milk, salt and pepper, level tablespoonful flour.

Trim and wash the cauliflower. Divide it into four or six pieces according to its size. Put them in a double saucepan with the butter and a gill of milk, and let the water boil quickly underneath until the cauliflower is quite tender. Strain off the liquid. Mix the flour with cold milk to a thin paste, adding a good seasoning of salt and pepper and the milk from the cauliflower. Put it into a small saucepan and stir while it boils for 5 minutes. Dish the cauliflower and pour the sauce over.

CAULIFLOWER FRITTERS.—1 cauliflower, 1 oz. cheese, ¼ pint milk, pinch of salt, 1 egg, fat for frying, ½ lb. flour.

Make the batter an hour before using.

Mix the salt and the flour, add the well-beaten egg and beat until smooth; continue beating while you add the milk, very gradually, and when it is a perfectly smooth batter leave in a cool place until required.

Boil the cauliflower for about 10 minutes—it must not be too tender. Strain and leave until cold. Divide the flower into small pieces. Dip each piece in batter and fry in boiling fat until nicely browned. Drain, and serve sprinkled with very finely grated cheese.

CAULIFLOWER SOUP.—1 cauliflower, ½ pint milk, 1 pint veal bone stock, salt and pepper, 2 oz. cheese.

Grate the cheese finely. Well wash the cauliflower and break it into small sprigs. Put them in a saucepan with the stock and boil gently until they are quite tender. Rub them through a sieve with the stock, season well with salt and pepper, heat the milk and add, and then bring all to the boil.

Serve the grated cheese separately or sprinkle a little over each cup of soup.

CELERY.—There are red and white varieties of celery, but the white is generally chosen when it is to be eaten raw.

Choose heads of medium size with a good hard white centre. Remove the outer part, wash it well and look it over carefully, for a tiny red worm often hides itself in the heart. So let it remain in very cold water for at least half an hour before eating. Serve in celery glass or tumbler.

CELERY AU GRATIN.—Cook the celery as directed in the following recipe. Put it in a casserole or pie dish, mix 2 oz. finely grated cheese with the sauce, pour it over the celery, cover with a layer of grated cheese and cook in a hot oven until nicely browned.

CELERY WITH SAUCE.—1 large or 2 smaller heads celery, ½ pint milk, 1 oz. flour, 1 oz. butter or margarine, pinch of salt, pepper.

Remove the outer sticks from the celery, wash it well and cut it in two-inch lengths. Put it in boiling water and boil gently for 5 minutes. Then drain off the water and pour in the milk. Simmer gently until the celery is quite tender but do not let it boil.

Melt the butter in a small saucepan, then very gradually stir in the flour, keeping the mixture perfectly smooth, cook for 3 minutes and add a good seasoning of salt

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and pepper and gradually mix it with the milk from the celery. Beat smooth with a wooden spoon and stir while it simmers for 5 minutes. Dish the celery in a very hot tureen and pour the sauce over.

CHEESE-AND-POTATO PUDDING. — 1 gill milk, ¼ lb. cheese, ¼ lb. floury potatoes, 1 oz. margarine, 1 egg, pepper and salt.

Gas Regulo Mark 6, Electricity 425° F.

Steam the potatoes and then mash them very smoothly, add the cheese finely grated, the pepper and salt, then the egg well beaten and mixed with the milk. Put the mixture in a well-buttered pie dish and, on top of this, small scraps of margarine, and bake in a moderate oven for half an hour.

CHEESECAKES, ALMOND. — ¼ lb. ground almonds, ¼ lb. castor sugar, 1 tablespoonful lemon or orange juice, ¼ lb. short pastry, 1 egg.

Gas Regulo Mark 6, Electricity 425° F.

Mix together the ground almonds, fruit juice and castor sugar; add a well-beaten egg. Grease patty pans and line them thinly with short pastry. Almost fill them with the almond mixture.

Roll out some scraps of the pastry thinly and cut it into narrow strips. Put two strips on each cheesecake, crossing them in the centre. Bake 15 minutes in a moderate oven.

CHEESECAKES, CHOCOLATE.—¼ lb. short, sweet pastry, 2 oz. unsweetened chocolate, 8 drops vanilla essence, 2 oz. ground almonds, 2 oz. margarine, 2 oz. castor sugar, 1 egg.

Gas Regulo Mark 7, Electricity 450° F.

Grate the chocolate, put it in a basin with the margarine, and beat it to a cream. Add the ground almonds, vanilla and sugar and beat well. Then mix to a paste with the well-beaten egg. Line patty tins with pastry and nearly fill with this mixture. Bake for 15 minutes in a hot oven.

CHEESECAKES, LEMON.—¼ lb. short pastry, lemon curd.

Gas Regulo Mark 6, Electricity 425° F.

Grease patty pans and line them thinly with pastry. Fill with lemon curd and bake for about 10 minutes. If liked well flavoured, mix a little lemon juice with the curd before using.

CHEESE CUSTARD PUDDING.—¼ pint milk, 1 egg, 1 oz. grated cheese, 1 tablespoonful breadcrumbs, salt and cayenne pepper.

Gas Regulo Mark 5, Electricity 400° F.

Beat the yolk of the egg with a good pinch of salt and a few grains of cayenne. Add the milk, breadcrumbs and grated cheese. Mix well, then stir in the whipped white of the egg. Turn into a buttered dish and bake in a moderate oven until set, for about half an hour.

CHEESE SAVOURY. — 1 oz. grated cheese, 1 egg, 1 oz. margarine, 2 ripe tomatoes, 1 small onion or shallot, salt, pepper, mustard, buttered toast.

Slice the tomatoes, simmer them until tender and rub them through a sieve.

Chop the onion or shallot very finely and fry it until soft in the margarine, add the tomato, then the beaten egg, the cheese and a good seasoning of salt, pepper and mustard.

Stir mixture over very gentle heat or in a double saucepan until thick. Do not let it boil. Serve on squares of hot, buttered toast. (*See also* EGG-AND-CHEESE SAVOURY.)

CHEESE SOUFFLÉ. — 2 oz. grated cheese, 2 eggs, 1 large teaspoonful cornflour, salt and pepper, scrap of margarine, ¼ pint milk.

Gas Regulo Mark 4, Electricity 375° F.

Use the margarine to grease a soufflé dish, and tie a piece of white paper round the soufflé dish so that it rises an inch or two above the dish.

Mix the cornflour with the milk, stir until it boils and continue to cook gently for 4 minutes. Then add the pepper, salt and cheese finely grated (Parmesan for preference), and leave at the side of the stove to keep warm.

Separate yolks from whites of eggs; beat yolks very slightly. Whisk the whites to a firm froth. Stir the warm mixture into the yolks and stir to mix. Then lightly fold in the whipped whites. Turn into the soufflé dish and bake for about 35 minutes.

Serve the soufflé immediately it is done.

CHOCOLATE BISCUITS.—6 oz. flour, ½ small teaspoonful baking powder, 1 tablespoonful cocoa, 3 oz. margarine, 3 oz. castor sugar, 1 egg, about 1 tablespoonful milk.

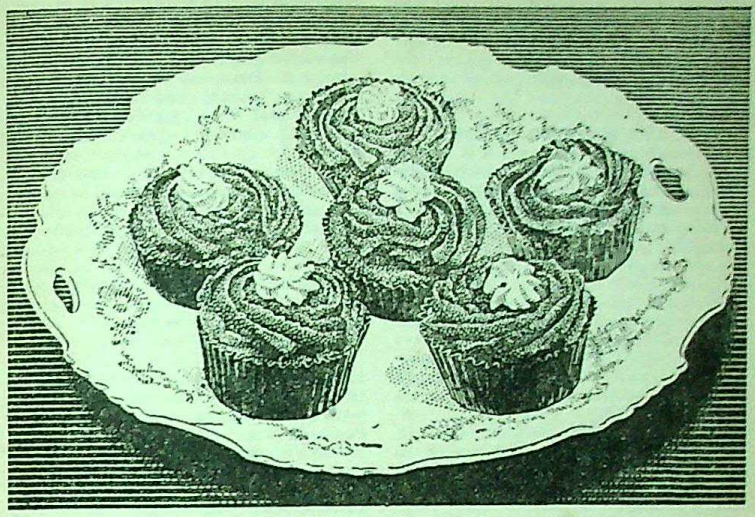
Gas Regulo Mark 4, Electricity 375° F.

Mix flour, baking powder and cocoa together. Beat margarine and sugar to a soft cream, then beat in the egg. Gradually add the flour mixture, working in to form a soft dough. If the egg is small you will probably need the milk.

Roll out, cut in fancy shapes and bake in a rather slow oven. These biscuits are very good plain but they may be iced with chocolate icing (*see* ICINGS) or sandwiched in couples with whipped or mock cream mixed with grated chocolate.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Chocolate cream cakes may be decorated with small roses of whipped cream, as shown in this illustration, an addition which improves both the appearance and the taste

CHOCOLATE CAKE.—6 oz. self-raising flour, ¼ lb. margarine, ¼ lb. castor sugar, 1 level tablespoonful cocoa, pinch of salt, 1 egg, 3 tablespoonsful milk, 1 teaspoonful castor sugar.

Gas Regulo Mark 5, Electricity 400° F.

Beat the margarine and sugar to a very soft cream. Mix together flour, salt and cocoa and sift them so that they are evenly mixed. Add a well-beaten egg to the margarine and sugar. Beat for a minute. Then gradually add the flour mixture, lightly, and last of all the milk.

Turn into a well-greased tin, sift a little castor sugar over the top and bake for 1 hour.

This cake may be iced with chocolate icing or cut through and sandwiched with a layer of chocolate butter icing.

CHOCOLATE CREAM CAKES.—6 oz. self-raising flour, 3 oz. margarine, 2 oz. castor sugar, 2 level tablespoonsful cocoa, ½ teaspoonful vanilla, 4 tablespoonsful milk, 1 egg.

Gas Regulo Mark 6, Electricity 425° F.

Mix the cocoa smoothly with the milk and add the vanilla.

Beat margarine and sugar to a soft cream. Then add a little beaten egg and flour alternately until both are used up.

Beat in the cocoa and milk and, when quite smooth, three-parts fill small, deep, patty pans with the mixture and bake for about 15 minutes. When cold, ice them with chocolate butter icing, putting it through an icing syringe or spreading it with a fork. Decorate with little roses of whipped cream or mock cream.

CHOCOLATE MERINGUE PUDDING.—¼ pint milk, 2 oz. cocoa, 2 eggs, 4 oz. castor sugar, 12 drops vanilla.

Gas Regulo Mark 4, Electricity 375° F.

Mix the cocoa smoothly with the milk. Put it into a saucepan and stir while it simmers for 2 minutes. Take it off the fire, turn into a bowl and leave to cool. When only just warm, stir in the beaten yolks of the eggs and 1 oz. of the sugar. Add the vanilla and mix well. Pour into a greased dish and bake in a very moderate oven until set—about three-quarters of an hour. Then beat the whites of the eggs until stiff and fold in the remainder of the sugar. Rough this on the top of the pudding; return to the oven until the meringue is a pale fawn colour.

CHOCOLATE PUDDING, BAKED.—6 oz. self-raising flour, 3 oz. sugar, 2 oz. margarine, ¼ pint milk, 1 tablespoonful cocoa, 1 egg.

Gas Regulo Mark 6, Electricity 425° F.

Beat margarine and sugar to a soft cream. Whip the egg and mix the milk

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with it. Add the cocoa to the flour and sift them. Stir them very gradually into the mixture and beat until smooth and evenly coloured. Turn into a greased pie dish and bake. Serve with custard or mock cream.

CHOCOLATE PUDDING, STEAMED.—6 oz. self-raising flour, pinch of salt, 3 oz. margarine, 2 level tablespoonsful sugar, 3 oz. cocoa, 1 egg, 2 tablespoonsful milk. Sauce: 2 oz. plain chocolate, 2 tablespoonsful icing sugar, ¼ teaspoonful vanilla.

Add the salt to the flour and rub in the margarine until thoroughly mixed. Stir in the sugar and cocoa and mix well. Beat the egg and mix it with the milk. Make a hole in the middle of the dry ingredients, and mix, then beat to a smooth, evenly coloured batter. Turn into a well-greased basin, tie a greased paper over and steam for 2 hours.

For the sauce, grate the plain chocolate, put it in a small double saucepan with the vanilla and the icing sugar and stir over boiling water until it has melted and is a smooth liquid.

Turn out the pudding, sprinkle it with sugar and pour the chocolate sauce round.

CHOCOLATE SAUCE.—To serve with chocolate steamed pudding or plain sponge puddings, such as Castle Puddings. 3 oz. plain chocolate or 2 oz. good cocoa, 3 oz. sugar, 1 oz. cornflour, ½ pint water, vanilla essence.

Put three-quarters of the water into a saucepan with the sugar and stir until it boils, then add the grated chocolate or cocoa mixed to a paste with water; bring again to the boil. Mix the cornflour with a little water, and add it. Stir until it has boiled for 5 minutes, and then drop in the vanilla.

CHRISTMAS CAKE, ECONOMICAL.—1 lb flour, 1 dessertspoonful baking powder, ½ lb. butter or margarine, ¼ teaspoonful each of salt, mixed spice and cinnamon, ½ lb. raisins, ½ lb. currants, ¼ lb. mixed peel, 6 oz. Demerara sugar, 2 eggs, a little milk.

Gas Regulo Mark 3, Electricity 350° F.

Mix together baking powder, flour and spices and sift them. Beat butter and sugar to a soft cream. Beat the eggs well. Now add a little of the flour, then a little beaten egg alternately to the creamed butter and sugar until all are used. Sprinkle in the fruit, beating all the time, and add enough milk to form a dough that will just drop from the spoon. Turn into a tin lined with greaseproof paper and bake for 3 hours in a moderately hot oven.

CHRISTMAS CAKE, RICH.—½ lb. flour, 1 teaspoonful baking powder, ½ teaspoonful powdered cinnamon, ¼ teaspoonful powdered ginger, ½ lb. margarine or butter, ½ lb. Demerara sugar, 6 oz. each of sultanas, raisins and currants, ¼ lb. mixed peel, 2 oz. ground almonds, the rind of ½ a lemon, 4 eggs, 1 tablespoonful rum.

Gas Regulo Mark 2, Electricity 325° F.

Mix together the flour, baking powder and spices and sift them.

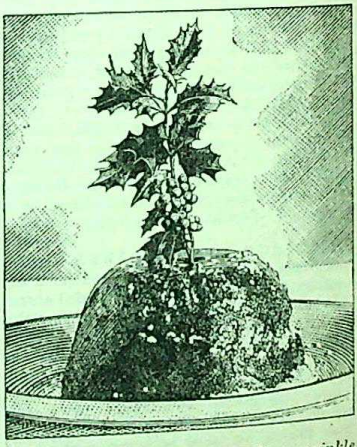
Prepare the fruit. Beat the butter and sugar to a soft cream. Beat the eggs for 5 minutes and then beat them by degrees into the butter and sugar, add gradually the flour mixture, then the almonds and fruit and last of all the rum. Mix until it is a smooth, creamy mixture.

Turn it into a tin lined with two thicknesses of greaseproof paper and bake 4 to 5 hours in a slow oven. Cover with greaseproof paper as soon as it is sufficiently brown.

This cake will remain moist for several months if kept in an air-tight tin.

CHRISTMAS PUDDING, RICH.—¼ lb. each currants, raisins, sultanas, mixed peel, suet, flour, breadcrumbs, Demerara sugar, juice of a small lemon, 2 tablespoonsful orange marmalade, 1 teaspoonful mixed spice, ½ teaspoonful ground ginger, ½ teaspoonful ground cinnamon, small teaspoonful salt, 4 eggs, ½ pint stout, small wineglassful brandy (optional).

Prepare the fruit. Mix the spices and



When serving Christmas pudding sprinkle a little sugar over it according to taste

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

salt with the flour and sift them. Chop the suet very finely.

Mix all the dry ingredients evenly together, then add the marmalade, well-beaten eggs and enough stout to form a soft dough. Stir well until all are thoroughly mixed and there is no dry flour left. Cover with a cloth and leave until next day. Then sprinkle in the brandy and stir again.

Fill basins with the mixture, cover with greaseproof paper and then with a cloth. Boil for 10 hours. Store in a dry place until required.

CHRISTMAS PUDDING, WITHOUT EGGS.—This pudding does not require eggs. A very good pudding, but will not keep long, so should be made only as required. ½ lb. breadcrumbs, ½ lb. self-raising flour, 3 oz. suet, ½ lb. currants, ½ lb. raisins, 1 tablespoonful marmalade, ½ lb. sultanas, 2 oz. candied peel, 1 large tablespoonful golden syrup, ½ teaspoonful each powdered cinnamon, ginger and mixed spice, ½ pint milk, ½ lb. sugar.

Slice the peel, stone and chop the raisins, shred the suet very finely. Mix together the spices and flour and sift them; add the suet, breadcrumbs, fruit, marmalade, sugar and syrup. Mix well, then stir in the milk, and beat until thoroughly mixed.

Turn into a well-greased basin, cover with greaseproof paper and then with a cloth, and boil 3 hours.

CHRISTMAS PUDDING, WITHOUT FLOUR.—This pudding is very light and digestible, containing no flour. 1 lb. raisins, ½ lb. currants, ½ lb. sultanas, ½ lb. mixed peel, ¾ lb. Demerara sugar, ¾ lb. fine breadcrumbs, 4 eggs, 2 tablespoonsful milk, ½ lb. suet, 2 oz. ground almonds.

Prepare the fruit, slice the peel very thinly and shred the suet finely. Beat the yolks and whites of the eggs separately.

Mix together all the dry ingredients. Then beat in the yolks of the eggs and the milk and finally the white of the eggs. Stir until well mixed. Fill well-greased basins with the mixture, cover with greaseproof paper and then with a cloth and boil for 6 hours. A wineglass of brandy is a great improvement but not necessary.

CHUTNEY, APPLE AND TOMATO.—2 lb. cooking apples, 1½ lb. ripe tomatoes, 1 lb. onions, ½ lb. sultanas, 1½ lb. Demerara sugar, 1 level tablespoonful salt, ¼ a small teaspoonful cayenne, 1 level dessertspoonful ground ginger, 6 chillies, ½ teaspoonful ground mace, 1 lemon, 1 quart vinegar.

Peel, core and cut up the apples, skin and chop the onions very finely, slice the tomatoes. Put them all in an earthenware bowl, add the sugar, sultanas, salt and spices, and pour over the vinegar. Leave for 24 hours. Then boil very gently for 1½ hours, add the juice of a lemon and continue boiling another 1½ hours. Bottle when cold and cork securely.

CHUTNEY, GOOSEBERRY.—1 quart green gooseberries, 1 lb. prunes, ½ lb. sultanas, ½ lb. stoned raisins, 1 lb. onions, 1 teaspoonful salt, ½ teaspoonful cayenne pepper, 1 tablespoonful ground ginger, 1 quart vinegar, 1 lb. Demerara sugar.

Top and stalk the gooseberries, and put them in a preserving pan with the onions peeled, sliced and chopped, the prunes stoned and very finely chopped, the sultanas, the spices, pepper and salt. Pour the vinegar over and boil to a soft pulp. Then add the sugar. Stir over gentle heat until the sugar has quite dissolved, turn into warm, dry jars and cover with cellophane or cork tightly.

The chutney must be stirred several times while cooking so that it does not stick or burn.

CORNISH PASTIES.—¾ lb. short or flaky pastry, 3 large potatoes, ½ lb. rump steak, 1 large onion, sprig of parsley and thyme, salt and pepper.

Gas Regulo Mark 7, Electricity 450° F.

Chop the thyme and parsley very finely. Peel and slice the potatoes, cut the steak into very thin, small pieces and slice the onion.

Now roll out the pastry about an eighth of an inch thick; cut it in rounds, using a saucer as guide. On each round put a few slices of potato, then some pieces of steak and a slice of onion. Season with salt and pepper and sprinkle a little chopped herb on each. Place another round on the top, damp the edges and press them well. Make one or two holes in the centre with a skewer. Brush over with egg or milk and bake three-quarters of an hour.

CUSTARD, BAKED.—1 pint milk, 2 eggs, 1 oz. sugar, a little grated lemon rind or other flavouring, a small piece of margarine.

Gas Regulo Mark 2, Electricity 325° F.

Grease a pie dish with the margarine. Beat the eggs lightly. Mix with them the sugar, the lemon rind and milk. Turn into the pie dish. Stand the pie dish in a baking tin containing enough water to reach half-way up the side, and bake in a very moderate oven until set. It must not be allowed to boil. Serve hot or cold.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CUSTARD, BOILED.—1 pint milk, 1 dessertspoonful cornflour, 1 egg, 1 oz. sugar, lemon rind or vanilla.

Mix the cornflour to a thin paste with a little of the milk. Put the remainder of the milk into a saucepan and bring to the boil, then pour it on the cornflour, return to the saucepan, add the sugar and stir while it boils for five minutes. Cool a little, and stir in the well-beaten egg.

For a lemon-flavoured custard, put the yellow part of the rind of half a lemon into the milk, then heat the milk with the rind until well flavoured before making the custard.

For vanilla custard add a little vanilla when the custard is cool.

DAMSON-AND-APPLE JELLY. — 1 lb. good cooking apples, 1 lb. damsons, ¼ lb. granulated sugar, ½ oz. gelatine.

Put the damsons in a casserole with four ounces of granulated sugar and enough water just to cover, and cook in a moderate oven until quite tender.

Rub through a sieve. Peel, core and cut the apples in small pieces. Cook with 2 tablespoonsful of water until well pulped. Mix with the damson purée and add the remainder of the sugar and simmer 10 minutes longer, stirring well. Add the gelatine (dissolved in a little water and strained). Stir until thoroughly mixed, then turn into a plain or fancy mould and leave until cold. Turn out. Serve with cream or custard.

DAMSON JAM.—6 lb. damsons, 5 lb. sugar.

Put the fruit in a preserving pan, just cover with cold water and simmer until the fruit is very soft. Then rub through a coarse sieve, put the sieved fruit and juice back in the preserving pan. Add the sugar after warming it slightly in the oven, and a few damson kernels. Boil until it sets when tested, pour into warm, dry jars and store in a cool, dry place in the usual way.

DAMSON TRIFLE.—1 lb. damsons, 1 sponge sandwich, ¼ lb. sugar, ¼ pint cream or ½ pint custard.

Stew the damsons with the sugar and a little water until they are quite soft; then rub them through a sieve.

Cut the sponge sandwich through the centre. Put half the purée in it and the remainder on the top. Leave until quite cold. Whip the cream until stiff and pile it on the top, or cover with thick custard.

DANDELION SALAD.—In early spring the very young leaves of the dandelion make an excellent salad. Wash them well and dry them. Serve with shredded lettuce and cream cheese.

DANDELION WINE.—4 quarts dandelion flowers, 1 gallon water, 1 orange and 1 lemon, 1 oz. whole ginger, 3½ lb. sugar to a gallon of liquor, 1 tablespoonful yeast.

Into a tub put the dandelion flowers and on them pour a gallon of water which has been boiled and allowed to cool until only just warm. Stir well, cover with a thick cloth and let it stand for three days, stirring it occasionally. Then strain off the flowers, boil the liquid for half an hour with the thinly peeled rind of 1 lemon and 1 orange, the ginger well bruised, and 3½ lb. of sugar to each gallon of liquid. Then add to the boiling liquid the lemon and orange cut into slices, and, when cool again, put in a piece of toast spread with yeast and let it stand for two or three days. Put it into a cask; let it stand for two months and then bottle it.

DATE-AND-APPLE ROLL.—¼ lb. short pastry, ½ lb. dates, 1 lb. apples, ¼ pint milk, 1 oz. butter, 1 oz. granulated sugar.

Gas Regulo Mark 6, Electricity 425° F.

Stone the dates, peel and core the apples and chop both dates and apples. Roll out the pastry and spread it with the dates and apples, roll it up and put it in a pie dish or baking tin. Bring the milk to boiling point, add the butter and sugar and pour them over the roll. Bake in a moderate oven for 30 to 45 minutes. Serve with custard.

DATE-AND-ORANGE PUDDING. — ½ lb. dates, ¼ pint milk, 1 dessertspoonful cornflour, ¼ lb. castor sugar, scrap of margarine, 1 egg, 1 orange.

Stone the dates and chop them. Well grease a pie dish with the margarine; put in the dates, sprinkle them with the grated rind of half the orange mixed with 1 tablespoonful of the sugar. Pour over the strained juice of an orange and leave for 1 hour.

Mix the cornflour smoothly with a little of the cold milk. Boil the remainder of the milk, pour on to mixed cornflour, return all to the saucepan with the remainder of the orange rind finely grated and a dessertspoonful of sugar, and stir constantly while it boils for 5 minutes. Take it off the fire and mix very gradually with the well-beaten yolk of the egg. Stir for a few minutes, then pour gently on to dates.

Whip the white of the egg until stiff and dry. Fold in the remainder of the sugar. Pipe or pile this on the pudding and brown lightly in a moderate oven.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DATE CAKE.—½ lb. self-raising flour, 2 oz. margarine, 2 oz. lard, 2 oz. sugar, ½ lb. dates, grated rind of ½ a lemon, 1 egg, milk to mix.

Gas Regulo Mark 5, Electricity 400° F.

Chop the dates finely, beat the margarine, lard and sugar to a cream, add the lemon rind and dates. Gradually mix it all in the flour, and add the well-beaten egg and enough milk to form a batter that will just fall from the spoon. Turn into a well-greased tin and bake about 1 hour in a moderate oven.

DATE PUDDING. — ½ lb. self-raising flour, ½ lb. suet, ½ lb. dates, a good pinch of salt, ½ a lemon, 1 oz. Demerara sugar, milk to mix.

Stone and chop the dates and shred the suet finely. Mix together flour, dates, suet, salt and the sugar; then add the grated rind and strained lemon juice. Stir in enough milk to form a soft batter that will drop from the spoon. Turn into a well-greased basin, cover with greaseproof paper and steam for 2½ hours. Custard flavoured with lemon rind makes a good sauce for this pudding.

DATE SANDWICH.—6 oz. self-raising flour, 2 oz. cornflour, ¼ lb. butter or margarine, pinch of salt, 1 oz. castor sugar, 1 egg. Filling: ½ lb. dates, 1 oz. margarine, 1 tablespoonful orange or lemon juice, 1 tablespoonful water.

First make the filling. Stone and chop the dates, put them into a saucepan with the butter, fruit juice and water, and cook gently until they are quite soft. Mash them with a fork and leave until cold.

For the pastry, put the margarine into the mixed flour, cornflour and salt. Add these to the creamed butter and form a stiff dough with beaten egg, adding as little water as necessary.

Roll out the pastry and line a rather deep sandwich tin with it. Put in the date filling, cover with the remainder of the pastry and bake 25 minutes in a moderate oven. Serve hot or cold. If served cold it is delicious if covered with a thin coating of lemon or orange icing.

DEVONSHIRE SPLITS.—1 lb. flour, 1 oz. butter, ½ oz. yeast, ½ oz. castor sugar, ½ pint milk, a little salt.

Gas Regulo Mark 7, Electricity 450° F.

Cream the yeast and sugar together until they are liquid, and then add the tepid milk. Sift the flour and a pinch of salt into a basin, stir in milk with the butter melted in it and mix all to a smooth dough. Put the basin in a warm place and let the dough rise for 45 minutes. Now shape it into small round cakes, place them on a floured baking tin and bake them in a quick oven for 15 to 20 minutes. Split and butter them, and serve them hot. If eaten cold, split them and spread with a little thick cream and some jam.

DOUGHNUTS.—1 lb. flour, 1 small teaspoonful salt, 1 level tablespoonful baking powder, a good pinch of ground nutmeg, 6 oz. castor sugar, 1 egg, lard for frying.

Mix together all the dry ingredients. Beat the egg, mix it with the milk and stir them into the dry ingredients to form a dough. Knead it on a floured board until it is quite a smooth dough. Roll it out, but not very thinly; it should be quite a quarter of an inch thick. Cut it into rounds and fry them in hot lard. They will take 10 to 15 minutes. The fat must be sufficient to float them, and they will need turning. Drain them on a soft paper and then roll them in castor sugar before serving. Serve hot with jam, or, if eaten cold, make a cut in the centre and fill it.

DRIPPING.—To clarify, put the dripping in a large basin, and cover it well with boiling water. Stir until melted, and leave until cold and set. Then take off the dripping and scrape it quite clean underneath, and it is ready for use.

DRIPPING FRUIT CAKE.—½ lb. self-raising flour, 3 oz. Demerara sugar, 3 oz. clarified dripping, 2 oz. raisins, 2 oz. currants, 2 oz. candied peel, 1 egg, milk to mix, pinch of salt.

Gas Regulo Mark 5, Electricity 400° F.

Sift the flour, rub in the dripping, add a good pinch of salt; stir in the sugar, stoned raisins, currants and sliced peel. Beat in the egg and enough milk to make a batter that will drop from the spoon. Turn into a well-greased tin and bake for 1 hour in a moderate oven.

DRIPPING SEED CAKE.—½ lb. flour, ½ lb. sugar, 1 oz. caraway seeds, pinch of salt, 2 teaspoonsful baking powder, 4 oz. dripping, 1 oz. peel, 1 egg, ½ teaspoonful mixed spice, 1 gill milk.

Gas Regulo Mark 5, Electricity 400° F.

Mix the salt with the flour. Rub in the dripping, then add the sugar, seeds, chopped peel, spice and baking powder. Beat the egg, mix it with the milk and with them form a dough of the dry ingredients. Put the mixture into a greased tin and bake in a moderate oven for nearly an hour.

DUCK, ROAST.—Gas Regulo Mark 7, Electricity 450° F.

Ducks are at their best for roasting when about 3 months old. When choosing a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

duck see that the feet are pliable and yellow, and the breast firm to the touch.

Prepare the bird for roasting; stuff it with either sage and onion or apple forcemeat. (*See* FORCEMEATS.)

Put a little dripping into a baking tin and make it hot. Then put in the duck, cover with greaseproof paper and roast for 45 minutes to 1 hour according to the size of the bird. Remove the paper about 20 minutes before it is done, so that it is nicely browned.

Serve with the bird a good gravy made by stewing the giblets. Pour off all the fat from the baking tin, strain into it half a pint of giblet gravy, add a little flour and boil for several minutes. Strain and use.

Apple sauce should accompany duck if it is stuffed with sage and onion.

DUMPLINGS.—6 oz. self-raising flour, pinch of salt, 2 oz. suet.

Shred the suet very finely. Mix together flour, salt and suet. Add enough cold water to make a stiff dough. Form into small balls, flour them, and cook for 20 minutes in boiling water or with the meat with which they are to be served.

EELS.—To skin an eel, cut the skin in a ring at the back of the gills, hold the fish firmly with a cloth and pull off the skin with a pair of tweezers.

EELS, FRIED.—2 lb. eels, salt and pepper, 1 egg, fine breadcrumbs, few sprigs of parsley, 1 dessertspoonful flour, fat for frying.

Skin and cleanse the eels. Cut them in pieces 2 to 3 inches long. Dry them thoroughly and flour them. Season the breadcrumbs with salt and pepper. Well whisk the egg. Dip the pieces of eel into the beaten egg and then coat with breadcrumbs. Fry in boiling fat 15 to 20 minutes, according to the thickness of the eels. Drain well. Serve very hot and garnished with cut lemon and parsley.

EELS, STEWED.—2 lb. eels, 1 onion, 1 clove, salt, pepper, ½ teacupful milk, a few sprigs of parsley, 1 oz. margarine, 1 oz. flour.

Well wash the eels, skin them, cut them into 2-in. lengths, and let them lie in strong, hot, salted water for about half an hour. Meanwhile, put the trimmings from the eels, the heads and the tails, into a saucepan with the onion, clove, a good sprig of parsley and about a pint of cold water. Simmer them for at least half an hour, and then strain. Melt 1 oz. margarine in a saucepan, stir in the flour and mix together until smooth; then pour in the strained liquid and stir until boiling. Take the pieces out, drain them well and put into saucepan with sauce; stew very gently for about 1 hour. When tender, add milk, salt and pepper to taste. Lift on to hot dish, strain a little sauce over it, and sprinkle with finely chopped parsley.

EGG-AND-CHEESE SAVOURY.—4 eggs, 4 squares of bread, 2 tablespoonsful grated cheese, a little mustard, 3 tomatoes, salt and pepper, 2 oz. dripping or lard, ½ oz. margarine.

Slice the tomatoes and put them in a small saucepan with the margarine and a seasoning of salt and pepper. Cook gently until quite soft. Rub through a strainer and keep hot. Heat the lard or dripping in a small pan and when very hot put in the pieces of bread and fry them for a few minutes to a golden brown. Drain them for a minute, then spread a thin layer of made mustard on each, cover this with grated cheese and make them very hot under a grill. Poach the eggs and put one on each toast, pour the warmed-up purée over and serve at once.

EGGS BAKED WITH HAM.—4 eggs, 2 oz. potted or very finely minced ham, 1 oz. margarine, 1 tablespoonful grated cheese, 1 small onion.

Gas Regulo Mark 4, Electricity 375° F.

Butter four large, deep saucers and line them with the ham mixed with a little finely grated onion. Carefully break an egg into the centre of each and sprinkle cheese on top; add a scrap of margarine.

Into a large baking tin put hot water about half an inch deep, and stand the saucers in this. Bake until the eggs are set.

EGG CROQUETTES.—3 eggs, 1 tablespoonful boiled rice, 2 oz. cheese, 1 tablespoonful tomato ketchup, salt and pepper, 2 large tablespoonsful fine breadcrumbs, mashed potatoes, fat for frying.

Boil two of the eggs for ten minutes and leave them until cold, then chop them rather finely. Mix with them the cheese finely grated, the rice and a tablespoonful of breadcrumbs, season with salt and pepper and the tomato ketchup, and bind with half the well-beaten egg. Form into cutlets on a floured board. Dip first into beaten egg, then into breadcrumbs and fry a golden brown in smoking fat. Drain well and serve in a border of mashed potato.

EGGS, CURRIED (WITH SALAD).—3 eggs, 2 oz. margarine, 1 teaspoonful anchovy essence, 1 level teaspoonful curry powder, lettuce or watercress.

Boil the eggs hard, leave them until cold, then shell and cut them in halves. Take

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

out the yolks and pound them with the butter, curry powder and anchovy essence. Put this paste into a jar and stand it in boiling water; stir until well blended. Cool, then fill the egg whites with this mixture, and serve on lettuce leaves or watercress, shredded and sprinkled with salad dressing.

EGG SALAD IN JELLY.—2 eggs, 6 spring onions, 3 small tomatoes, 2 tablespoonsful cooked green peas, 1 tablespoonful vinegar, salt and pepper, ½ oz. powdered gelatine, heart of a lettuce, mayonnaise dressing.

Boil the eggs for 10 minutes and put them in cold water. Dissolve the gelatine in a pint of hot water. Skin the tomatoes, chop the onions finely and slice the eggs.

When the gelatine is cold and beginning to set, stir in the onions, tomatoes, peas, eggs and the vinegar seasoned with salt and pepper. Turn into small moulds or glasses, or one large mould if preferred, and leave to set.

Serve as cold as possible surrounded by the lettuce leaves sprinkled with mayonnaise dressing.

EGGS, SCRAMBLED (WITH TOMATOES).—3 eggs, 3 large tomatoes, salt and pepper, 2 oz. margarine or butter, 2 tablespoonsful milk.

Cut the tomatoes across in halves, put them, cut side uppermost, on a baking tin, with a scrap of butter on each and a sprinkling of salt and pepper. Place them in a moderate oven until they are thoroughly hot.

Melt the remainder of the fat in a small saucepan, break the eggs into it, add salt, pepper and milk and stir well until the mixture is thick. Then pile it on the tomatoes.

EGG SAUCE.—To white sauce add 1 hard-boiled egg, coarsely chopped, just before serving.

EGGS, TO CODDLE.—Coddled eggs are regarded as more digestible than boiled eggs.

Into a saucepan pour sufficient boiling water to cover completely the number of eggs you wish to cook. See that the water is actually at boiling point, and then slip in the eggs carefully. Draw the pan to the side of the stove, where the water will keep its heat without actually reboiling, and let the eggs stand thus, uncovered, for about 10 minutes. Treated in this way, eggs will be adequately cooked without the white part hardening. Many people who, in the ordinary way, cannot eat boiled eggs, can digest them cooked this way.

ELDERBERRY WINE.—1 gallon elderberries, 1 gallon water, 3½ lb. loaf sugar, white of 1 egg, ¼ oz. ground ginger, ½ oz. cloves, 2 tablespoonsful yeast, 1 piece of toast.

The berries should be fully ripe and black. See that they are clean, strip them from their stalks and measure them.

Put them in an earthenware pan, such as a bread pan. Pour over them a gallon of boiling water and let it stand for not less than 12 hours.

Then strain off and boil the liquor with 3½ lb. of loaf sugar. When boiling, clear it by adding the whisked white and crushed shell of an egg. Remove any scum. Strain through a flannel bag and to it add the ½ oz. of cloves and ¼ oz. of ground ginger for every gallon of wine. Then pour it into a tub and when cool put in a piece of toast, spread with yeast. Let it ferment for a few days; then draw it off and put it into a cask. Leave the bung loose until fermentation has quite ceased, then bung tightly. It should stand 6 months before being bottled, and makes an excellent hot drink in winter.

ENDIVE.—Endive makes a wholesome salad and blends well with celery and beetroot.

Remove roots and outside leaves, wash well and shake dry in a cloth. Arrange the leaves round a salad bowl, with sliced beetroot and celery cut in cubes in the centre. Sprinkle with oil and vinegar dressing or with mayonnaise.

FAGGOTS.—½ lb. stale bread without crust, ½ lb. fat pork without lean, ½ lb. pig's liver, salt and pepper, a sprig of sage and thyme, some pig's caul, ½ lb. onions.

Gas Regulo Mark 7, Electricity 450° F.

Cut the bread in small pieces, put it in a basin and just cover it with warm water; leave to soak until it is quite soft. Drain it in a colander, pressing out as much water as possible, then beat it with a fork. Cut the liver and fat pork into very small pieces. Slice the onions, mix them with the pork and liver and put all through a mincer.

Chop the sage leaves and thyme very finely and mix them with the bread and a good seasoning of salt and pepper. Add the minced meats, and when all are evenly mixed, form into balls. Wash the caul and cut it in squares with a pair of scissors, wrap each meat ball in a piece of caul and put them in a greased baking tin. The tin must not be too large, as they must be packed quite closely together. Bake three-quarters of an hour in a hot oven. They may be served hot or cold.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FAIRY CAKES.—3 oz. margarine, 3 oz. castor sugar, 1 egg, a little milk, 2 tablespoonsful marmalade, ¼ lb. flour, 1 teaspoonful baking powder.

Cream the margarine and sugar, and then add a well-beaten egg and the marmalade. Work the mixture well together and when creamy and light, stir in the flour and baking powder and enough milk to form a soft, smooth dough. Have ready some greased patty pans, half-fill them with the mixture and bake in a quick oven for about 20 minutes or until they are a golden brown.

FAT.—To clarify, cut up scraps of suet or uncooked fat. Put the pieces into a large iron saucepan, with just enough water to cover them. Put the pan at the side of the stove and cook the fat, gently stirring at intervals, until the pieces have been reduced to shrivelled scraps. Then strain into a large basin of cold water and put aside until next day, when the fat will have risen to the surface and formed a hard white cake. Lift this out of the basin and scrape away any sediment that may have formed at the bottom of the cake. When clarified, fat will keep much longer than it would do if left in its natural state.

FIG MINCEMEAT.—½ lb. apples, 4 oz. each figs, raisins and currants, 2 tablespoonsful orange or lemon marmalade, 4 oz. castor sugar, 3 oz. suet, rind and juice of a lemon, 1 teaspoonful ground ginger and of ground cinnamon.

Peel, core and chop the apples; shred the suet very finely. Mix figs, stoned raisins and currants and put them through a mincer. Mix all the ingredients thoroughly together, and be careful to store in airtight jars. This makes delicious mince pies or roll puddings, and gives you a surplus to draw upon should the occasion demand it.

FIG PUDDING.—6 oz. flour, 4 heaped tablespoonsful fine breadcrumbs, ¼ lb. shredded suet, 3 oz. sugar, a good pinch of salt, 1 heaped teaspoonful baking powder, ½ lb. figs, grated rind of 1 lemon, 1 egg, 1 breakfastcupful milk.

Mix the salt and baking powder with the flour and put them through a sieve. Mix the suet with the flour and rub it in lightly with the tips of the fingers. Add the sugar, breadcrumbs and grated lemon rind and mix well. Next stir in the figs cut in small pieces.

Whip the egg lightly, add it to the mixture and continue stirring while you add the milk gradually. Turn into greased basin, cover with greaseproof paper and finally steam for about 3 hours.

FIG PUDDING WITH FRUIT.—¼ lb. brown breadcrumbs, ¼ lb. suet, 2 oz. Demerara sugar, ½ lb. figs, 2 oz. currants, 1 egg, 1 teacupful golden syrup, 2 tablespoonsful milk.

Shred the suet very finely and chop the figs. Mix them together and add the sugar and currants. Beat the egg with the syrup. Add them gradually to the dry ingredients, beating all the time, and finally stir in the milk. Turn into a well-greased basin and steam for 3 hours. Serve with lemon-flavoured custard.

FIG ROLY-POLY.—¾ lb. flour, 6 oz. lard or clarified dripping, pinch of salt, 1 lb. figs, ½ lemon, 1 tablespoonful castor sugar.

Rub the fat lightly into the flour until it looks like fine breadcrumbs. Add the salt and just enough very cold water to form a dough that will roll easily. Roll it out, chop the figs and spread them over the dough, leaving a margin of dough all round. Sprinkle over it the grated rind and strained juice of the lemon and the sugar. Roll up, tie in a cloth, put in boiling water and boil for 1½ hours.

This pudding may also be steamed in a basin. Line the basin with pastry, then a layer of chopped figs, lemon and sugar. Repeat the layers, finishing with pastry, cover with a cloth and steam 3 hours.

FISH.—When choosing fish, the following points should be remembered.

When fish is fresh the gills are red and moist, the eyes bright and full, and the flesh firm and not flabby.

Choose fish of medium size; very large fish are often coarse in flavour.

Mackerel and fresh herrings should be very bright with a silvery sheen.

When buying shellfish, such as lobster or crab, choose those that are heavy for their size.

FISH BAKED IN BATTER.—Sole, whiting or haddock, 1 egg, 1 small piece of margarine, 3 tablespoonsful milk, 1 level tablespoonful flour, salt, pepper, lemon juice.

Gas Regulo Mark 6, Electricity 425° F.

Sift the flour with a pinch of salt, add gradually a well-beaten egg and continue beating until they are a smooth mixture. Add the milk by degrees, beating all the time. When quite smooth, beat for 5 minutes longer. Leave for an hour.

See that the fish is clean, dry it with a cloth and cut it into very small pieces, removing any skin. Butter a small fireproof dish, put in the fish, sprinkle with salt and pepper and a squeeze of lemon juice. Pour in the batter, add the margarine cut in tiny pieces—about ½ oz. will be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

enough—and bake for 30 minutes in a rather quick oven. All dishes containing batter should be served as soon as they are cooked.

FISH BAKED IN MILK.—1 lb. of any white fish preferred, free from skin and bone, 1 oz. margarine, salt and pepper, milk to cover.

Gas Regulo Mark 4, Electricity 375° F.

Grease a fireproof dish, remove any skin from the fillets and wash them, put them in the dish and sprinkle with a little salt and pepper. Just cover with milk and put the remainder of the margarine in small scraps on the top. Cook in a moderate oven 15 to 20 minutes according to the thickness of the fish. Drain off the milk and use it to make a sauce, shrimp, anchovy, cheese or mushroom. Pour the sauce over the fish, garnish with parsley or cut lemon and serve very hot.

FISH CAKES.—An excellent way to use up left-over fish and potatoes. About ½ lb. cooked fish and the same quantity boiled potatoes, sprig of parsley, 1 oz. margarine, 1 teaspoonful anchovy essence, 1 egg, fine breadcrumbs, fat for frying, 1 dessertspoonful flour.

See that the fish is quite free from skin and bone and divide it into flakes. Rub the potatoes through a sieve. Then mix them with the fish and the finely chopped parsley, and pound well together. Melt the butter and stir it in, add the anchovy and bind with half a well-beaten egg. Form into cakes, flour them and leave for an hour to "settle." Then dip first in egg and then in breadcrumbs and fry golden brown.

FISH, CURRIED.—Any kind of fish may be curried, and it is an excellent way to improve a somewhat flavourless fish, such as fresh haddock or codfish. 1 to 2 lb. fish, 2 oz. dripping, 1 cooking apple, 2 medium-sized onions, sprig of thyme, ½ pint stock, ¼ teaspoonful curry powder, 1 teaspoonful ground rice, salt and pepper, ¼ pint milk, 1 dessertspoonful flour, few grains cayenne (if liked).

Cut the fish in small strips, about 2 or 3 inches in length, and dry each one carefully. Season the flour with salt and sprinkle it on the fish.

Melt the fat in a stewpan, then add the fish, the apple and onion, peeled and sliced, and the thyme finely chopped. Fry until the fish is well browned, then mix the curry powder and ground rice with the stock and add. Simmer all gently for 15 minutes. Add the milk, season if necessary and add the cayenne. Serve very hot in a border of boiled rice after sprinkling with chutney or sweet pickle.

FISH, DEVILLED.—1½ lb. filleted fish, 1 tablespoonful fine breadcrumbs, 1 oz. margarine, salt and pepper, 1 teaspoonful lemon juice, few grains cayenne pepper and mustard, 1 dessertspoonful chutney.

Gas Regulo Mark 7, Electricity 450° F.

Wash and dry the fillets. Chop the chutney finely and mix it with the lemon juice, a little salt and pepper, made mustard and a sprinkling of cayenne. Grease a shallow baking dish, put in the fillets—the dish must be large enough to spread them in a single layer—spread the chutney mixture on them, sprinkle over the breadcrumbs and put the butter in small scraps on the top. Bake in a hot oven for 10 minutes, or longer, according to thickness, and serve at once.

FISH FRIED IN BATTER.—4 oz. flour, 1 tablespoonful liquid margarine or salad oil, ¼ pint warm water, white of an egg, salt and pepper, fillets of fish or slices, fat for frying.

Mix the salt and pepper with the flour and sift well. Stir in gradually the oil or melted margarine and mix until quite smooth, then stir in the warm water. It must be only lukewarm, not hot. Mix to a smooth cream and then add the well-whipped white of an egg. Dry the fish well, dip it in the batter, then immediately immerse it in smoking fat and fry a golden brown. There must be a sufficient quantity of fat to float the fish, and it will also be necessary to turn during frying. Drain well and serve very hot.

Fillets will take 5 to 10 minutes to cook, according to their thickness; very thick slices will require about 15 minutes.

FISH FRIED IN EGG AND BREADCRUMBS. — Fillets of fish, or small whole fish or larger whole fish may be fried in this way. Fish, as above, fine breadcrumbs, a little flour, 1 egg, salt and pepper, fat for frying.

Prepare the fish and dry it well and then flour it. Beat the egg well on a plate. Mix a sprinkling of salt and pepper with the breadcrumbs and put them on a sheet of kitchen paper. Dip a fillet or fish into the beaten egg and see that it is well coated all over.

Now drain the fish from the egg and place it on the breadcrumbs, tossing them over on to the fish from either side; when well coated with crumbs, pressing them in to make them stick, put into smoking fat. If the fat is deep enough it will not need turning, but if it does not cover completely, turn it over when one side is brown. Be sure the fat is smoking hot when fish is put in; you will know the heat is right when a little blue smoke is rising from it. If

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the fish is thick it will need about 15 minutes' cooking and the heat must be reduced as soon as it is brown; but thin fillets will be done as soon as they are brown on both sides.

FISH FRIED WITHOUT BREADCRUMBS OR BATTER.—Fish may be fried without either batter or breadcrumbs. Cut codfish, haddock or any similar fish in slices across. Dry them well and dust over with seasoned flour. Heat enough fat in a frying pan to prevent the fish sticking, and, when it is quite hot, put in the fish and fry over moderate heat until brown on both sides, turning over with a fish slice.

FISH, GRILLED.—Grilling is easy in these days, when almost every house possesses an electric or gas grill.

When using an electric grill, it should be switched on high for 2 minutes before using. With a gas grill, turn the flame on full for 4 minutes before using. Then the heat in each case must be reduced as found necessary, according to the thickness of the fish.

A grid-iron or grid-pan should be kept exclusively for fish and absolute cleanliness is most essential. Before using the grid, first warm it and then rub well with kitchen paper.

When fish such as bloaters or herrings are grilled whole, remove the heads and tails, and after cleaning the fish thoroughly, dry them.

Then make two or three cuts just through the skin to prevent it bursting while cooking. Dust very lightly with flour, brush over with liquid butter or oil, season with salt and pepper and place on the grid-iron. Then put it under the hot grill, turning once or more if it is a thick fish but being careful not to break it. Do not stick a fork into the fish, but turn with grilling tongs or a fish slice.

FISH STEAMED IN MILK.—This is very nourishing and digestible for an invalid. 2 fillets fish, such as whiting or sole, or 4 if they are small, about 1 gill of new milk, ½ oz. butter, 1 heaped dessertspoonful fine breadcrumbs, sprig of parsley.

Roll the fillets, and put them upright in a little basin or breakfast cup. Sprinkle the breadcrumbs among them, cover with milk and put in the butter. Twist a piece of greased paper over, and steam 20 to 30 minutes, according to the thickness of the fillets. Turn out carefully and garnish with parsley.

FISH, STUFFED AND BAKED. — Whiting, herrings, or small fresh haddock may be stuffed with forcemeat and baked.

Gas Regulo Mark 5, Electricity 400° F.

Clean the fish, then cut off the fins and the end of the tail with scissors. Dry them well, and fill the opening through which the fish has been cleaned with any good forcemeat. (*See* FORCEMEATS.) Sew up the opening with a needle and coarse thread. Leave an inch or two of thread at one end so that you can draw it out easily before serving.

Allow 1 oz. of dripping for the smaller fish such as whiting, 2 oz. for a haddock. Melt the fat in a baking tin or fireproof dish in the oven. Lay the fish in the tin, and, with a spoon, pour a little of the fat over it. Sprinkle with breadcrumbs and bake in a moderate oven, basting it with the fat several times during the cooking.

If using a casserole or a fireproof dish serve it in the dish. If preferred you can lift the fish on to a hot dish and pour the liquor round. Either way the thread must be removed before serving.

FISH, TO BOIL.—Large fish, such as salmon or turbot, may be boiled, but steaming is a better method for small or cut fish, such as fillets, etc. The fish should be cleaned and washed and then placed on the strainer in the fish kettle and covered with warm water, a teaspoonful of salt and a small teaspoonful of vinegar to every quart of water. When the water boils, remove any scum, then reduce the heat and simmer. Allow about 10 minutes to the pound and 10 minutes over, but remember that a thick fish will need longer than a flat one.

FISH, TO CLEAN.—With flat fish, such as sole or plaice, first scrape off the scales with a small, sharp knife, working towards the head. Then make a slit in the throat or underpart of the head and remove the inside, washing the fish out well with salted water afterwards.

To clean the round kinds, such as fresh haddock and whiting, make a slit in the under part of the fish about three parts down the fish from the head to the tail, then empty them and wash in salted water.

Red mullet and smelts are exceptions; these are not emptied but just drawn through the gills.

FISH, TO FILLET.—With flat fish, such as sole, cut off the fins, then with a sharp knife cut down the fish right along the side of the centre bone from head to tail.

Now slide the knife along between the bone and the flesh and cut off the fillets neatly. Draw away the fillet with the left hand as you cut. Try to keep the knife as close to the bone as possible, so

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

that you will not leave any pieces of flesh behind. Remember in cutting off a left-hand fillet that you cut towards the tail. For a right-hand one, turn the fish round and work towards the head.

To fillet round fish, such as herrings, cut off the fins. Then cut right down the middle of the back, cutting to the bone. With the tail towards you, cut away the fillet on the left-hand side, keeping the knife as close to the bone as possible, then, with the head towards you, remove the other fillet in exactly the same way.

FISH, TO STEAM.—Prepare and wash the fish. Put it in a steamer over boiling water and sprinkle with salt and lemon juice. Cover closely and see that the water keeps boiling under it until the fish is sufficiently cooked. Steaming takes longer than boiling—10 to 15 minutes to the pound according to the thickness.

FISH, TO STEAM BETWEEN PLATES.—With this method small pieces of fish retain all their flavour.

Grease a deep plate or soup plate with butter, put the fish on it, season with salt, pepper and lemon juice and cover with buttered paper. Place the plate on a saucepan of boiling water and cover with another plate. See that the water boils briskly until the fish is done. A fillet or slice of fish will take 20 to 25 minutes.

FLAT FISH, TO SKIN.—Cut the skin across at the tail end with a wet knife. Then lift the skin and loosen the edges well all round the sides with the first finger.

Now, holding the fish firmly down on the board with one hand, take the skin between the first finger and thumb of the other hand and draw it off from the head towards the tail.

Round fish are also skinned from the head downwards. First cut the skin through on both sides quite close to the fins, then make a cut just below the head. Loosen the skin and pull gently down towards the tail. Then turn the fish, and remove the skin on the other side in the same way.

FORCEMEAT, APPLE (FOR GOOSE OR PORK).—1 lb. apples, 4 oz. breadcrumbs, 2 tablespoonsful sugar, 1 oz. margarine, 1 well-beaten egg.

Peel, core, and quarter the apples and put them into a casserole with the margarine and enough water to moisten the bottom of the casserole. Cook slowly, until the apples are tender, then add the sugar and breadcrumbs, and beat well. Finally, bind with a little beaten egg, and use.

FORCEMEAT, CHESTNUT (FOR TURKEY OR FOWL).—1 lb. chestnuts, 4 oz. breadcrumbs, 2 oz. margarine, salt, pepper, small pinch of powdered mace, 1 beaten egg for binding, milk.

With a sharp knife make a slit in each of the chestnuts, put them into a pan of boiling water and boil them for 20 minutes. Drain them and remove both the outer and the inner skins, which will come off easily. Put the shelled chestnuts into a saucepan, with enough milk to cover, and simmer slowly until the liquid is absorbed and the chestnuts are tender. Then mash them smoothly, add the breadcrumbs and warmed margarine, also the seasoning, and bind with a little beaten egg.

FORCEMEAT, FOR FISH.—Herb forcemeat may be used for stuffing fish such as herrings, fresh haddock, whiting, etc., but the following is a delicious forcemeat for special occasions. 2 oz. breadcrumbs, 1 oz. suet, 6 oysters, pinch of pounded mace, ½ saltspoonful salt, a good sprinkling pepper, 3 tablespoonsful cream or top of the milk, 1 egg.

Shred the suet finely and mix it with the breadcrumbs. Add the liquor of the oysters and the oysters cut up small, the mace, salt, pepper and the cream. Stir in the beaten egg and cook over very gentle heat, stirring all the time, for 5 minutes. Leave it until cold, then stuff the fish.

FORCEMEAT, HERB (FOR MUTTON, POULTRY OR VENISON).—3 oz. breadcrumbs, 1 oz. finely shredded suet, bacon fat or dripping, 2 oz. lean ham or bacon, 2 teaspoonsful finely chopped fresh herbs, 1 teaspoonful finely chopped parsley, 1 oz. onion shredded finely (if liked), salt and pepper, 1 egg.

Mix together the breadcrumbs and suet—or bacon fat, if you have it, as it greatly improves the flavour. Add the lean ham finely chopped, the herbs, parsley, onions, a half-teaspoonful of salt and a good sprinkling of pepper. Bind with the well-beaten egg, and use.

FORCEMEAT, MUSHROOM. — This forcemeat should be made when field mushrooms are in season—it is not nearly as good when made with forced mushrooms. It may be used to stuff turkey, fowl, game or fish. 4 tablespoonsful breadcrumbs, 4 medium-sized mushrooms, 1 oz. butter, salt and pepper, a few drops of onion juice, sprig of thyme and parsley, 2 small rashers fat bacon, 1 egg.

Cut the bacon into small dice. Chop the thyme and parsley. Peel and slice the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mushrooms. Melt the butter in a small stewpan, add the mushrooms and fry for 5 minutes. Season with salt and pepper, add the bacon, onion juice, parsley and herbs and fry gently for 5 minutes longer. Turn into a basin, stir in the breadcrumbs and mix well; then bind with a well-beaten egg, and use.

FORCEMEAT, SAGE-AND-ONION (FOR GOOSE OR PORK).—1 lb. onions, 6 fresh sage leaves, 1 small teaspoonful salt, ½ teaspoonful made mustard, 1 breakfastcupful breadcrumbs, seasoning of pepper, 1 small teaspoonful castor sugar.

Boil the onions until almost tender and drain thoroughly. Chop them finely, as also the sage. Mix all the ingredients well together and use, allowing the breadcrumbs room to swell.

FORCEMEAT, SAUSAGE (FOR POULTRY).—½ lb. pork sausage meat, 3 oz. breadcrumbs, 1 chicken or turkey liver, sprig of parsley, thyme and marjoram, ½ teaspoonful salt, a good sprinkling of pepper, a little stock, gravy, or 1 well-beaten egg.

Chop the liver very finely and also the herbs. Mix together liver, sausage meat, breadcrumbs and herbs and season well with salt and pepper. Add a little stock or gravy or beaten egg to bind.

FOWL, BOILED.—1 fowl, ½ lb. each onions and carrots, a piece of celery when in season, 4 white peppercorns, sprig of thyme and parsley, salt and pepper, 1 slice lemon, ½ lb. rashers bacon; parsley, celery, cream or mushroom sauce.

Draw and truss the fowl ready for boiling and rub it over with a slice of lemon to keep it white.

Put it in a pan with the onion, carrot and celery cut in small pieces, a good seasoning of salt and pepper, the peppercorns and herbs. Cover with boiling water.

As soon as it comes to the boil again, carefully remove all scum and simmer gently until quite tender. Dish on a very hot dish, pour the sauce over and garnish with rashers of fried bacon.

An old fowl is excellent cooked in this way, but it must only be allowed to come to the boil and then simmer very gently until quite tender, the water moving round it all the time, but not bubbling quickly.

Strain the broth into a bowl and leave until next day, then skim off all grease and it will be an excellent stock for any soup. Reduced by fast boiling, it will set as a jelly and make a delicious mould with the remains of fowl and scraps of bacon.

FOWL, BRAISED.—1 fowl, 2 fat rashers bacon, 1 onion, 1 carrot, 6 mushrooms, 1 small blade of mace, 1 piece celery, 1 pint seasoned stock or giblet broth.

Joint the fowl, fry the bacon and then brown the joints of fowl in the fat from the bacon. Put it in a stewpan with the onion cut in slices, the carrot and celery cut in cubes, and the mushrooms washed and peeled or a dessertspoonful of mushroom ketchup. Add the mace, pour the stock over, close the lid tightly and simmer gently until the fowl is tender—about 2 or 3 hours. The time will depend on the age of the fowl.

Put the fowl and vegetables on a hot dish, add to the stock a teaspoonful of flour mixed with water and boil rapidly, with the lid off, until it is reduced to about a teacupful of thick, brown gravy. Pour over the fowl and serve very hot.

FOWL, ROAST.—1 fowl, 2 rashers fat bacon or a few slices fat from boiled bacon, 2 oz. dripping for basting, herb, sausage, mushroom or chestnut forcemeat. (*See* FORCEMEATS.)

Gas Regulo Mark 7, Electricity 450° F.

Fowls are sometimes roasted without being stuffed, but a good forcemeat is a vast improvement. The forcemeat is put in the neck end of a fowl, then the loose skin drawn over and fastened down with a small skewer. About 1 oz. of dripping put in the body of the bird will help to keep it moist during the cooking.

Heat the dripping in a baking tin, then put in the fowl and cover it with the fat bacon. Put it in a good hot oven and baste well during the cooking. Remove the bacon about 10 minutes before it is done so that it is well browned.

Serve with bread sauce and a good, well-seasoned gravy made with the giblets.

When preparing an old fowl for roasting, put it in a pan of fast-boiling water. When it has boiled for 3 or 4 minutes, remove any scum and simmer for 2 hours until almost tender. Leave it in the broth until cold. Then take it out, drain and dry it and stuff it with a good forcemeat (*see* FORCEMEATS), and roast until it is nicely browned. It will probably require about half an hour.

FRUIT, BOTTLED.—If you possess a sterilizer you need only obey instructions. The oven method, however, is very easy and reliable. You will need screw-topped bottles. Scald them, and also the lids, with boiling water. Then fill them with fruit, shaking it down to get as much as possible in each; put the tops on loosely and stand them in a warm, but not hot, oven, the Regulo Mark at ½, temperature 275° F.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

If you are using a gas stove with a back burner, see that no bottle gets pushed right to the back, as it may crack if directly over the flame. Leave them until the fruit has shrunk a little and looks cooked. Hard fruits like plums need about 1 hour; soft fruits will be ready in half that time. Take out two bottles and fill up one from the other. Pour in *boiling* water to the brim, put on rubber ring and lid and immediately screw down the top as tightly as possible. The secrets of success are to use new rubber rings, to be sure that the water is boiling and to screw each one as soon as it is filled.

To test: leave for 48 hours, then remove screw top and see if you can hold the bottle up by the lid. If you can, it is air-tight and will keep indefinitely.

GAME, GRILLED.—A delicious way of cooking small game. Cut the birds in halves and wipe the insides with a damp cloth. Brush over with liquid butter or dripping, sprinkle with a little salt and cayenne and a little liquid from chutney. Place them on a hot, well-greased grid-iron under a grill, and cook about 8 minutes each side for a bird the size of a small partridge, or 15 minutes each side for a pheasant. Serve with chip potatoes.

GAME PUFFS.—This is a good way of using the remains of game. Cut any scraps of left-over game into shreds, moistening with a little gravy and a little red-currant jelly. Roll out some pastry and cut it into rounds, put some of the game mixture into the centre of each, wet the edges and double the pastry over. Brush over with beaten egg and bake for about 15 minutes in a hot oven.

Gas Regulo Mark 7, Electricity 450° F.

GAME, ROAST.—1 bird or brace of birds, slices of fat bacon, small piece of butter, dripping for basting.

For the Gravy.—1 pint stock from giblets, 1 teaspoonful flour, 1 teaspoonful liquid butter, a few drops of browning, cayenne pepper, salt, 1 shallot, 1 small wineglassful port wine (optional).

Gas Regulo Mark 7, Electricity 450° F.

Lard the birds with fat bacon, using a larding needle, or just covering them well with slices of the bacon. Put a small piece of butter or fat bacon inside the birds to keep them moist and juicy. Place them in a tin with some liquid dripping and baste well; that is the secret of success, for dry game is lacking in flavour.

Remove the bacon 5 minutes before the birds are done, and baste; then brown nicely and serve very hot.

The time for roasting will vary according to the bird: Grouse, half to three-quarters of an hour. Partridge, 25 to 30 minutes. Pheasant, 1 to 1½ hours.

For the Gravy.—Wash and cut up the giblets and put them in a stewpan with 1½ pints of water, the shallots peeled and sliced, cayenne, salt and stock. Simmer gently for an hour. Strain off the gravy, add to it the flour and butter thickening, the browning and port wine. Simmer for 10 minutes. Serve very hot.

Bread sauce or fried breadcrumbs and red-currant or crab-apple jelly are served with game.

GAME WITH EPICURE SAUCE.—1 tablespoonful olive oil, 1 tablespoonful tarragon vinegar, 1 sprig of thyme, 1 slice of onion, 1 sprig of parsley, 1 teaspoonful lemon juice, pinch of pepper and salt, 1 egg, breadcrumbs, game such as pheasant, partridge or grouse, fat for frying.

For the Sauce.—Yolk of 1 egg, pinch of salt and pepper, 1 dessertspoonful made mustard, 2 tablespoonsful salad oil, 1 dessertspoonful tarragon vinegar, 1 shallot, 3 small gherkins, pinch of cayenne.

Mix together the oil, vinegar, finely chopped parsley and thyme, finely chopped onion and lemon juice.

Cut the bird into small, neat joints, put them in a deep dish, pour over them the above mixture, and let them remain for three hours, turning the game about every quarter of an hour so that it is well flavoured. Then take out the pieces, drain them, wipe dry with a clean cloth, dust them with flour, dip into beaten egg, then into fine breadcrumbs and fry in smoking fat for 15 minutes.

Serve very hot with the following sauce. Well whisk the yolk of an egg with a good pinch of salt and pepper and a dessertspoonful of made mustard, beat in drop by drop 2 tablespoonsful of salad oil and 1 dessertspoonful of tarragon vinegar. Chop very finely 1 shallot and 3 little gherkins, add them to the sauce, with a pinch of cayenne, mix well and serve as directed. The sauce may be made before it is wanted, and kept in a cool place for a reasonable period without deterioration.

GINGER BEER.—2 gallons water, 2 oz. whole ginger, 3 lb. sugar, 4 juicy lemons.

Well bruise the ginger. Use five lemons if small or not very juicy. Squeeze the lemons and strain the juice, put the sugar, lemon juice and ginger into an earthenware pan and pour in 2 gallons of boiling water. Stir it well, then cover with a cloth and leave until next day. Strain it and bottle very securely. Screw-top bottles are best. Leave for a week before using.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

GINGERBREAD.—½ lb. flour, ¼ lb. treacle, 1 tablespoonful Demerara sugar, 2 teaspoonsful ground ginger, 3 oz. margarine, 1 egg, ½ teaspoonful bicarbonate of soda, 3 tablespoonsful milk.

Gas Regulo Mark 4, Electricity 375° F.

Put sugar, margarine and treacle in a small saucepan and dissolve over gentle heat. Take the pan off the fire.

Mix the ground ginger with the flour and stir them into the treacle mixture; add the egg, well beaten, and the milk with the soda dissolved in it. Beat until well mixed. Then turn into a well-greased square tin and bake for about 45 minutes in a moderate oven.

GINGERBREAD BISCUITS.—½ lb. self-raising flour, a good pinch of salt, 2 oz. margarine, 1 teaspoonful ground ginger, 1 large tablespoonful golden syrup.

Gas Regulo Mark 4, Electricity 375° F.

Mix well together flour, ginger and salt. Rub in the margarine until evenly mixed. Warm the syrup and add enough to form a firm dough. Roll out thinly, cut into rounds and bake in a moderate oven for a quarter of an hour.

GINGER BUNS.—½ lb. self-raising flour, 4 oz. castor sugar, 1 teaspoonful ground ginger, 2 oz. margarine, 2 oz. glacé ginger, 1 egg.

Gas Regulo Mark 5, Electricity 400° F.

Mix well together the flour, sugar and ground ginger. Melt the margarine and stir it in, add the glacé ginger, finely chopped, and enough beaten egg (about half will be sufficient) to form a soft dough. It must not be at all sticky. Grease a baking tin. Form the dough into balls the size of a large marble and press them lightly on the tin, leaving room to spread. Bake about a quarter of an hour in a moderate oven.

GINGER PUDDING, BAKED.—½ lb. flour, 4 oz. margarine, 3 oz. Demerara sugar, 1 large tablespoonful golden syrup, ½ teaspoonful bicarbonate soda, ½ teacupful milk, 1 level teaspoonful ground ginger, 1 egg.

Gas Regulo Mark 4, Electricity 375° F.

Beat the margarine and sugar to a cream. Beat the egg well and mix it with the golden syrup, add this gradually to the sugar and margarine, and then sift in the flour with which the ground ginger has been mixed. Dissolve the soda in the milk and mix this well with the other ingredients. Turn into a well-greased tin, and bake in a very moderate oven for 1½ hours, when a clean skewer inserted in the centre should come out bright and clean. This indicates that the pudding is ready for use. Finally turn it out and serve.

GINGER PUDDING, STEAMED.—½ lb. flour, 1 teaspoonful baking powder, 1 heaped teaspoonful ground ginger, ½ lb. margarine, 2 oz. Demerara sugar, 1 tablespoonful golden syrup or treacle, 1 egg, 3 tablespoonsful milk.

Beat margarine to soft cream. Next beat in the well-whisked egg and the golden syrup. Mix thoroughly, add the milk and gradually stir in the flour mixed with ginger, sugar and baking powder. Beat well. When the mixture is smooth, turn it into a greased basin. Cover with greaseproof paper and a cloth and steam for two hours. Serve with ginger sauce.

GINGER SAUCE.—½ pint milk, 1 heaped tablespoonful flour, ½ teaspoonful ground ginger, 1 level tablespoonful granulated sugar, 1 oz. margarine.

Mix the ground ginger with the flour. Melt the margarine in a small saucepan, add the flour, stir to a paste and let it cook for a minute. Stir in the sugar and then little by little add the milk, stirring well all the time. When quite smooth, turn out the pudding, sprinkle it with sugar and pour ginger sauce round it.

GINGER SNAPS.—2 oz. flour, 2 oz. golden syrup, 2 oz. Demerara sugar, 2 oz. margarine, ½ teaspoonful ground ginger.

Gas Regulo Mark 5, Electricity 400° F.

Warm the margarine in a small saucepan, take it off the fire, add the other ingredients and mix well. Put the mixture in small spoonsful on a greased baking tin, leaving room to spread. Bake in a rather hot oven for about 10 minutes. Ease from the tin with a knife and, while warm, curl them on the handle of a wooden spoon.

GINGER SPICED CAKE.—½ lb. flour, 1 oz. brown sugar, 1 level teaspoonful each mixed spice and ground ginger, 1 level dessertspoonful dripping, 4 tablespoonsful milk, 1 tablespoonful golden syrup, ½ teaspoonful bicarbonate soda, 1 small teaspoonful cream of tartar.

Gas Regulo Mark 4, Electricity 375° F.

Mix together the flour, spices and cream of tartar. Stir in the sugar. Warm the dripping with the syrup and the milk and mix them well but do not make them hot, add the soda and at once stir them into the other ingredients. Turn the mixture into a well-greased tin and bake about 1 hour.

GOOSEBERRY FOOL. — 1 lb. green gooseberries, 3 oz. granulated sugar, ¼ pint water, ½ pint milk, 1 level tablespoonful custard powder, cream (optional).

Stalk the gooseberries, put them into a saucepan with the sugar and water and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cook gently until they are quite soft. Rub them through a sieve and leave until cool. Mix the custard powder with a little milk. Boil the remainder of the milk, pour it over the custard powder, return to the pan and bring to the boil. When cool, mix it with the sieved gooseberries and serve in glasses. Decorate with a little whipped cream.

GOOSEBERRY JAM. — Gooseberry jam should be made with unripe gooseberries but they should be fully grown. Made in this way it sets well and the skins are not tough. 4 lb. green gooseberries, 1 quart water, 6 lb. sugar.

Remove the tops and stalks from the gooseberries, put the sugar in a preserving pan with cold water and bring to the boil. Boil quickly for half an hour. Skim, add the fruit, bring again to the boil and boil steadily until it will set when tested, about half an hour. Pour into dry, warm jars.

GOOSE, TO ROAST.—*See* DUCK.

Cook 1½ to 2½ hours according to size.

GRAPEFRUIT TART.—6 oz. flour, 4 oz. margarine, pinch of salt, 1 teaspoonful baking powder, a little milk, grapefruit marmalade, juice of ½ a lemon, 2 tablespoonsful breadcrumbs.

Gas Regulo Mark 6, Electricity 425° F.

Mix the salt and baking powder with the flour and sift them. Rub in the fat until the mixture looks like fine breadcrumbs. Then add enough milk to make a rather stiff dough. Roll out and line a sandwich tin with the pastry. Now put in a layer of marmalade, half the breadcrumbs, another layer of marmalade, and the remainder of the breadcrumbs. Sprinkle the lemon juice over, decorate with strips of pastry, and bake in a moderate oven.

GREENGAGE JAM.—4 lb. greengages, 3 lb. sugar.

Choose greengages when they are fully grown, but before they begin to ripen. The jam will then be a good colour and set well.

Cut the greengages into halves and remove the stones, put the fruit on dishes, sprinkle the sugar over and leave until the following day. Turn into a preserving pan and boil gently until it sets when tested.

A few of the kernels may be added a little while before the jam is done if you like a nutty flavour.

Turn into dry, warm jars, and store in the usual way.

GREENGAGE MERINGUE. — 1 lb. greengages, 3 oz. granulated sugar, ½ pint milk, 2 eggs, ¼ lb. castor sugar, pinch of salt.

Gas Regulo Mark 3, Electricity 350° F.

Cut the greengages in halves and remove the stones and put the fruit into a saucepan with 2 oz. granulated sugar and 2 tablespoonsful water, and stew them gently to a pulp. Add about 6 of the kernels, mixing them with the pulp.

Separate the yolks and whites of the eggs; beat the yolks well with 1 oz. granulated sugar. Bring the milk to the boil, pour it on the yolks and cook in a double saucepan, stirring well until it thickens. Leave until cold. Put the greengage pulp in a dish and spread the custard over it.

Whip the whites of the eggs with a pinch of salt until they are stiff. Gently fold in the castor sugar. Pile this high on the custard, smoothing it upwards with a fork to form a peak, and bake in a very moderate oven until it has turned a pale biscuit colour.

GRILLING.—This is an easy process these days when almost every household possesses a gas or electric grill, and it is a method whereby all the nourishment is retained in the meat or fish.

To be sure the grid-iron is absolutely clean, grease it well, then heat it and rub off the grease with paper.

Light the grill and wait until it is red-hot before putting the meat under, let it be close to the heat for a minute or two to seal the juices in the meat, then slacken the heat. When sufficiently cooked on one side, turn it with a fish slice or grilling tongs; do not stick a fork into it or some of the gravy will be lost. A chop will need 5 to 10 minutes according to thickness and the taste of the diner, and a steak 1½ in. thick will need 15 to 18 minutes.

Serve immediately it is done.

(See also FISH, GRILLED.)

HADDOCK, FRESH.—Fresh haddock is not a full-flavoured fish but is very good cooked in the following way. 1½ to 2 lb. fish, 1 oz. margarine, 1 good-sized onion, a sprig of parsley and thyme, 1 teacupful tomato purée or ½ lb. tomatoes, salt and pepper.

Gas Regulo Mark 4, Electricity 375° F.

Skin and fillet the fish. Peel the onion and shred it finely. Chop the parsley and thyme. Melt the margarine in a small saucepan, add a sprinkling of salt and pepper, the herbs and onion. Fry until the onions are brown, then stir in the tomato purée and make very hot. Grease a fireproof dish or casserole. Wash the fish and put it in while wet; then pour the sauce over. Cover and bake about 10 to 15 minutes, according to the thickness of the fish.

If using fresh tomatoes, stew them until quite soft and then rub through a sieve.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

HAKE WITH HOLLANDAISE SAUCE.—1 to 2 lb. middle hake, ¼ pint milk, 1 tablespoonful flour, yolk of an egg, 1 tablespoonful lemon juice, 2 oz. cheese, 2 tablespoonsful fine breadcrumbs, 2 oz. margarine, salt and pepper.

Gas Regulo Mark 4, Electricity 375° F.

Steam the hake, then remove all skin and bone and flake the fish. Melt 1½ oz. of margarine in a stewpan, add the flour gradually and stir over gentle heat until it is a smooth paste; season with salt and pepper. Add the milk very gradually, stirring well all the time so that it is quite free from lumps, stir and simmer for 3 minutes. Remove from the fire and when cool stir in the yolk of an egg. When thoroughly mixed, add the lemon juice very gradually. Grease a fireproof dish; put in salt and pepper and then put a layer of the fish flakes and sprinkle with lemon sauce; repeat the layers, having the final one of sauce.

Grate the cheese finely, mix it with the breadcrumbs and, if liked, a sprinkling of red pepper. Put this mixture on the top of the fish, dot with a few scraps of margarine, and bake in a moderate oven until nicely browned.

HALIBUT.—A delicious fish very similar to turbot. It may be steamed and served with a good sauce, or baked in milk with a little butter. Being somewhat solid, it should be cut in very thin fillets if fried.

HAM AND EGGS.—3 eggs, 3 slices cooked ham, ¼ lb. tomatoes, 1 oz. butter or margarine, salt and pepper, 3 slices hot buttered toast.

Slice the tomatoes and put them in a saucepan with the butter and a good sprinkling of salt and pepper. Simmer until the tomatoes are quite soft. Then rub through a sieve and keep hot.

Poach the eggs and fry the slices of ham very lightly. On each slice of toast place a slice of ham and then a poached egg. Pour the tomato purée round and serve very hot.

HAM, BOILED.—A ham must be soaked overnight in lukewarm water and then well scrubbed before cooking. (*See* BACON.)

HAM ON TOAST.—2 eggs, ¼ lb. cooked ham, 1 oz. margarine, pepper and mustard.

Remove all skin and gristle from the lean ham, and chop it finely. Put it into a saucepan with the margarine, a little made mustard and a pinch of cayenne, and add the eggs, well beaten.

Stir until the mixture begins to thicken but is not solid, and then serve it arranged neatly on squares of buttered toast.

Garnish with small sprigs of parsley, or sprinkle with finely chopped parsley.

HAM, TO CURE.—Hams should be cured in cold weather when there are no flies about. For a ham about 16 lb. in weight: 1 lb. salt, 1 gill best vinegar, 1 lb. brown sugar, 2 oz. black pepper, 1 oz. saltpetre.

Put the ham in an earthenware pan (a large bread pan answers very well), and sprinkle the saltpetre over it, especially round the bone and knuckle. Leave it for 12 hours. Sprinkle the pepper, sugar and salt on the ham, pour the vinegar over and let it remain again for 24 hours.

Well rub the ham all over with the mixture once a day until you have liquid enough to baste the ham with a spoon.

Continue basting it each day with the liquid for a month.

Now hang it up in a warm place for a week to drain and dry, and afterwards put it in a bag, being careful to close it so that it is impossible for flies to get to the ham. Hang it in a dry place and do not use for at least three months.

HARE, JUGGED.—1 hare, 1 thick gammon rasher of bacon, 1 dessertspoonful salt, ½ teaspoonful pepper, ¼ teaspoonful ground cloves, 2 tablespoonsful flour, 1 large onion, rind of ½ lemon, ½ blade of mace, 1 bunch parsley and thyme, 1 wineglassful port wine.

Joint the hare, mix together the salt, pepper, cloves and flour to a thin paste with a teacupful of water. Dip each piece of hare in this mixture, then put them in a stewpan or casserole, with the thin lemon rind, the finely chopped onion, the mace, the parsley and thyme tied in a muslin bag, and the bacon cut in dice. Cover with water, close the pan tightly and simmer gently until the hare comes easily from the bone (3 to 4 hours). Take out the muslin bag, add the port wine, and serve with forcemeat balls (*see* FORCEMEATS) and red-currant jelly. The forcemeat balls should be fried brown and put in with the hare half an hour before it is done.

HARE, ROAST.—For roasting, a hare must be quite young; if not, it is better jugged. It is important to have plenty of dripping as it needs to be basted many times during the cooking, the flesh of hare being naturally very dry.

After being skinned and paunched, it must be well washed. Then fill it with forcemeat (*see* FORCEMEATS), sew it up and truss it. Cover with slices of the fat part only of bacon.

Make some dripping hot in a roasting

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tin, put in the hare and cover with greaseproof paper. It will need about 1½ hours. About half an hour before it is done, remove the paper and bacon and baste well and frequently; continue cooking until brown.

Dish the hare on a very hot dish. Pour off all fat from the tin. Mix a dessertspoonful of flour with half a pint of water or stock, add a dessertspoonful of tomato ketchup and a good seasoning of salt and pepper. Put it into the baking tin and stir while it boils for 3 or 4 minutes.

Add a wineglassful of port wine if liked. Strain and use. Red-currant jelly should be served with hare.

HERBS.—Do not forget to dry some herbs. They should be gathered before they begin to flower. Tie them in bunches and hang them in a warm room. When dry, they may be tied in paper bags and hung in a dry place, or rubbed to powder and stored in dry bottles or tins.

HERRING ROES ON TOAST.—Wash and drain the roes. For 4 roes put 1 oz. of butter or margarine into a small saucepan, add a sprinkling of pepper and about twelve drops of anchovy essence. When it is hot add the roes and cook gently for 6 minutes. Serve on hot buttered toast with the anchovy butter poured over them.

HERRING ROES WITH TOMATOES.—For 4 roes peel and slice 2 medium-sized tomatoes, put them into a small stewpan with 1 oz. of butter or margarine and a sprinkling of salt and pepper, simmer until the tomatoes are quite soft, and then rub through a sieve. Return this purée to the saucepan, sprinkle in half a teaspoonful of flour and cook very gently for 4 minutes, stirring all the time. Wash and drain the roes and cook them for 5 minutes in 1 oz. of margarine. Then add the tomato purée to them. Make very hot and serve on slices of buttered or margarined toast.

HERRINGS BOILED IN COURT BOUILLON.—Bouillon: Peel and slice a medium-sized onion; chop a piece of celery and a small carrot. Add to them three-quarters of a pint of stock made from veal bones, or the liquor from boiled veal or chicken. Put in also a small bunch of fresh herbs, a sprig of parsley, a good sprinkling of pepper and a teaspoonful of salt, unless the stock was already well seasoned, 4 peppercorns and 1 clove.

Bring to the boil, remove any scum and and then simmer for 1 hour. Be sure it does not boil; the water should be just moving all the time without fast bubbling.

Thoroughly clean 4 herrings and remove the heads. Put the fish into a fish kettle or boiler. Strain the bouillon and pour it over them. Simmer gently for 10 to 15 minutes, according to the thickness of the herrings. Drain and serve very hot, with or without mustard sauce as preferred.

The remaining bouillon may be used for fish soup thickened with flour and milk.

HERRINGS, DEVILLED.—4 herrings, 1 oz. butter or dripping, 1 large teaspoonful mustard, salt, cayenne pepper, 1 tablespoonful chutney, lemon juice, breadcrumbs.

Gas Regulo Mark 7, Electricity 450° F.

Prepare and bone the fish, cutting each one into 2 fillets. Mix together the mustard, a sprinkling of salt and of cayenne, the chutney finely chopped and a dessertspoonful of lemon juice.

Grease a casserole, put in the fillets skin side downwards, and spread the chutney paste on them. Cover lightly with breadcrumbs—baked ones for preference—put a few scraps of margarine or dripping on top and bake for 10 minutes in a hot oven.

HERRINGS, FRIED IN OATMEAL.—4 herrings, about 2 oz. dripping or other cooking fat, oatmeal, salt and pepper, 1 dessertspoonful lemon juice.

Prepare the fish and bone them. Make 2 or 3 small cuts in the skin of each. Put them on a dish, sprinkle with salt, pepper and lemon juice and leave for 20 minutes. Coat each fish with oatmeal. Make the fat very hot. Put in the fish, skin side uppermost. When brown, turn them. They will need about 8 to 10 minutes, according to their size. Drain well before serving.

HERRINGS, GRILLED. — 4 herrings, 1 oz. dripping or margarine, salt and pepper.

Cut the heads off the fish, scale and clean them. Then wipe with a cloth. Make 3 small cuts on each side to prevent bursting. Brush each fish over with a little liquid fat; sprinkle with salt and pepper. Place under a hot grill and cook for about 10 minutes, turning once or twice during the process. Serve as soon as they are cooked. When grilled herrings are intended for dinner or supper, serve them with mustard or tomato sauce, or

Savoury Butter.—Beat a little butter or margarine until creamy, then work in lemon juice and finely chopped parsley, anchovy essence, or tomato ketchup.

HERRINGS, PREPARING.—First cut off head, tail and fins, then scale the fish if this has not already been done. To do this, begin at the tail, scraping with the blade of a knife against the scales. Wash off loose scales under a cold tap.

Then split the fish down the centre of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the back towards the tail end. Spread it out gently, skin side downwards, on a board. Put the blade of the knife under the backbone, pulling it away gently with the left hand as you do so, keeping the knife close to the bone. You will find most of the small bones will come away with the backbone. Then remove any that remain.

HERRINGS WITH LEMON BUTTER.—Fillet 2 large herrings, wash and dry them. Season a tablespoonful of flour with a sprinkling of salt and pepper and a sprig of lemon thyme very finely chopped, or a small piece of lemon peel finely grated. Coat the dried fillets with this flour and fry them in smoking fat for 5 minutes. Drain thoroughly, place them on a very hot dish, pour the lemon butter over and serve at once.

Lemon Butter.—Melt 2 oz. butter or margarine, mix with it half a teaspoonful of finely chopped parsley, then, very gradually, a tablespoonful of strained lemon juice, and in addition a sprinkling of salt and pepper.

HERRINGS WITH MUSHROOMS.—2 large herrings, ¼ lb. mushrooms, 1 shallot, 1 oz. margarine, ½ teaspoonful chopped parsley, salt and pepper.

Gas Regulo Mark 4, Electricity 375° F.

Split the herrings, remove the centre bone and as many small bones as possible. Wash and peel the mushrooms and shallot. Chop these very finely.

Melt the margarine in a small pan, put in the mushrooms, shallot, chopped parsley and a good sprinkling of salt and pepper. Fry all gently for 5 minutes, stirring them occasionally. Turn this mixture on to a plate and leave until cold. Then use it to stuff the fillets, tying them round with string or securing with tiny wooden skewers.

Grease a casserole generously, put in the fish, cover with a greased paper, and bake for about 20 minutes in a moderate oven.

HONEY TARTS.—¼ lb. short pastry, 2 tablespoonsful honey, 1 oz. desiccated coconut, 2 tablespoonsful fine breadcrumbs, 1 dessertspoonful lemon juice.

Gas Regulo Mark 6, Electricity 425° F.

Roll out the pastry and line a greased tin plate with it, reserving a little for decoration.

Put the honey in a saucepan if it is thick or solid and heat with the lemon juice sufficiently to make it liquid; add the breadcrumbs and the coconut and mix well. Turn the mixture into the lined tin, decorate with bands of pastry and bake about 15 minutes. Serve either hot or cold.

HORSERADISH SAUCE.—1 horseradish, 1 level teaspoonful made mustard, ¼ pint milk, 1 dessertspoonful castor sugar, ½ teaspoonful salt, sprinkling of pepper, 1 tablespoonful vinegar.

Choose a short, thick horseradish. Wash, then scrape it perfectly clean.

Grate it finely and add the milk, salt, pepper, mustard and sugar. Mix well. Then gradually add the vinegar, stirring all the time.

ICING, ALMOND.—¾ lb. icing sugar, ¼ lb. castor sugar, ½ lb. ground almonds, 1 tablespoonful lemon juice, 1 teaspoonful rum or ½ teaspoonful flavouring essence, 2 eggs.

Roll the sugars free from lumps, then sift them through a fine sieve and mix well with the ground almonds, lemon juice and flavouring. Then, while beating all the time, add enough beaten egg to form a soft paste. Add the egg gradually, working it well and being careful not to add too much, as it must be firm. Allow it to stand for an hour or two before using it on a cake. To spread evenly use a stainless knife that has been dipped in hot water.

ICING, ALMOND (WITHOUT ALMONDS).—2 oz. margarine, 2 tablespoonsful water, ½ lb. castor sugar, 2 dessertspoonsful almond essence, ¼ lb. soya flour.

Cut up the margarine and put it in a saucepan with the water. Stir until it boils. Remove it from the stove and add the sugar and almond essence. Then stir the soya flour in gradually and beat to a perfectly smooth paste. Turn it on to a board dusted with icing sugar and knead it for 2 or 3 minutes. Wrap it in greaseproof paper and leave it in a cool place for 24 hours before using.

ICING, BOILED.—½ lb. granulated sugar, 4 tablespoonsful water, ½ a small teaspoonful cream of tartar, 1 teaspoonful lemon juice, white of 1 egg.

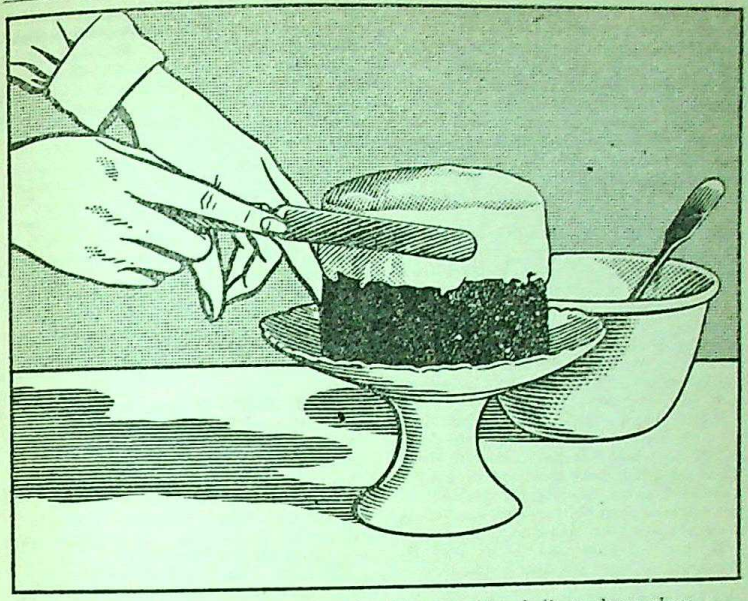
Put the sugar in a saucepan with the water, stir over gentle heat until the sugar has dissolved, then boil without stirring until the syrup forms a thread when taken up on a skewer. If you are using a thermometer it should register 240° F. Add the lemon juice and bring to the boil again and pour very slowly on to the stiffly whipped white of an egg mixed with the cream of tartar. Beat it until smooth, white and thick; spread with a warm knife.

ICING, BUTTER.—2 oz. fresh butter or margarine, ¼ lb. icing sugar, ½ teaspoonful flavouring essence.

Beat the butter or margarine with the sugar to a very soft cream, add the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



To ice a cake, the best way is to lay icing on with a knife as shown above

flavouring and beat again. Spread it over the cake and use as filling for a sandwich.

ICING, CHOCOLATE BUTTER.—1 oz. plain chocolate, 2 oz. fresh margarine, 3 oz. icing sugar, vanilla essence.

Rub the icing sugar through a fine sieve. Break up the chocolate and dissolve it in a tablespoonful of hot water. Beat the margarine to a soft cream and mix the icing sugar with it. Add the flavouring and the melted chocolate and beat to a smooth, evenly coloured cream.

Use as filling for layer cakes, or pipe as a decoration on the top of a cake.

ICING, CHOCOLATE, FOR CAKES.—4 oz. icing sugar, 3 oz. plain chocolate, 1 dessertspoonful water, vanilla essence.

Rub the sugar through a fine sieve and grate the chocolate. Put them into a small saucepan with the water, and stir over gentle heat until a smooth, creamy liquid is formed. Let it cool a little. Add the vanilla. Give it a stir round, then pour over the cake.

ICING, COFFEE BUTTER, is made in the same way as butter icing, adding enough coffee essence to make the cream a fawn colour. Use for piping or filling.

ICING, GLACÉ.—½ lb. icing sugar, 1 tablespoonful water, 1 teaspoonful lemon juice or any other flavouring.

Rub the sugar through a fine sieve, put it into a double saucepan with the water and flavouring, and stir until the sugar has quite dissolved and the mixture is just warm. It must not be made hot or it will be dull instead of glossy. Pour it gently over the cake, or put spoonsful of it on small cakes.

ICING, ROYAL.—½ lb. icing sugar, 1 teaspoonful lemon juice, white of egg.

Other flavouring may be added, but always use the lemon juice, as it helps to make the icing white.

Rub the icing sugar through a fine sieve. Roll it first with a rolling pin if it is hard or lumpy. Add the lemon juice and enough whipped white of egg to form a soft paste. Spread it evenly on the cake with a warm knife.

•

IRISH STEW.—About 2 lb. scrag end of neck of mutton, 1½ lb. potatoes, ½ lb. onions, 1 tablespoonful flour, 1 oz. dripping, salt and pepper, a sprig of thyme, marjoram and parsley.

Cut the meat into small pieces; add a good seasoning of salt and pepper to the

 CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flour and sprinkle it over the meat. Peel and slice the onions. Heat the fat in a stewpan and put in the meat and onions. Fry for 10 minutes, turning the meat several times. Put in the herbs and just cover with cold water. Bring to the boil. Skim well. Cover and simmer for 1 hour. Peel the potatoes and add them, and continue simmering until the potatoes are cooked. Skim off the fat. Serve in a deep, hot dish and sprinkle the parsley over.

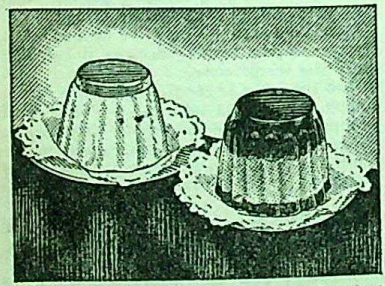
JAM AND JELLY.—General directions: If you grow your own fruit, choose a dry day to gather it. If you buy it see that it is dry and not over-ripe. Do not skim until the preserve is almost done—constant skimming is wasteful. Jars must be scrupulously clean, dry and warm when the preserve is put in. Covers may be of parchment or cellophane. Store preserves in a cool, dry place.

When making jelly use a fine hair sieve to strain the juice, leaving the fruit on the sieve until it has ceased to drip. Move the fruit about now and then with a wooden spoon, but do not press it if you want a clear jelly. This method is much simpler than using a jelly bag.

Recipes for jams and jellies will be found under their respective headings.

JELLY CREAMS.—½ pint packet of jelly, 1 pint of blancmange powder.

Blancmange powders, or creams as they are sometimes called, should be of the gelatine variety, not cornflour. First, make the jelly and leave until quite cold. Rinse out several small moulds, or a large one, with cold water, and pour in enough jelly to fill about ⅓ of each mould, and leave to set. Make the blancmange and when cold add, a spoonful at a time, to the jelly without disturbing it. Leave until required. These creams can be varied by using layers of jelly and cream, or half of each.



Turn jelly creams out carefully by just easing round the sides, then dip the moulds into warm water to loosen jelly

JUNKET.—1 pint milk, 1 dessertspoonful castor sugar, 1 large teaspoonful rennet, pinch of salt.

Make the milk lukewarm and in it dissolve the sugar and salt and add any flavouring liked. Turn into a glass dish, stir in the rennet and leave in a cool place until required. Serve with whipped or Devonshire cream. Fresh raspberries or strawberries are a good accompaniment.

JUNKET, DEVONSHIRE.—1 pint new milk, 1 teaspoonful essence of rennet, 1 tablespoonful castor sugar, a little grated nutmeg, whipped cream.

Put the sugar into a bowl, and on to it pour the milk, heated to the temperature of new milk; then stir in the rennet. Let it remain until set. Sprinkle with grated nutmeg, and serve with whipped cream.

JUNKET, EGG.—2 eggs, 1 pint milk, 2 oz. castor sugar, ½ teaspoonful lemon or vanilla essence, 1 large teaspoonful rennet.

Separate the yolks and whites of the eggs. Whisk the yolks for 5 minutes and add the flavouring. Beat the whites to a stiff froth. Then mix them together and beat again for 2 or 3 minutes.

Make the milk just lukewarm and dissolve the sugar in it. Pour this into the beaten eggs and stir in the rennet. Pour into a glass dish and leave till set.

KIDNEY, ROAST.—1 calf's kidney, 2 rashers of bacon, 1 teaspoonful flour, 1 teaspoonful mushroom or tomato ketchup.

Gas Regulo Mark 7, Electricity 450° F.

A calf's kidney makes a delicious dish for two. Buy a kidney with the suet round and roast from about 20 minutes according to size.

When almost done put the rashers of bacon over it and when they are cooked put on to a hot dish. Pour away any superfluous fat from the tin. Mix the flour and ketchup and add a teacupful of water. Put this into the baking tin and boil for 2 or 3 minutes, stirring well. Pour it round the kidney and serve very hot, with purée of spinach or peas and mashed potatoes.

KIDNEYS, GRILLED.—4 sheep's kidneys, 1 oz. butter, salt and pepper, 4 rashers bacon.

Skin the kidneys and cut them almost through. Brush over with butter, sprinkle with salt and pepper. Put them cut side uppermost in a fireproof dish under a hot grill. After two or three minutes, put thin rashers of bacon round them. Cook five minutes, turning once, and serve very hot.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

KIDNEY SOUP.—½ lb. ox kidney, 1 quart stock, 1 oz. dripping, 1 medium-sized onion, 1 clove, small bunch of fresh herbs, 1 dessertspoonful flour, salt and pepper to taste, 1 dessertspoonful mushroom or tomato ketchup.

Remove the fat and cut the kidney into small pieces; peel and slice the onion.

Heat the dripping in a pan with the sliced onion and fry for 2 or 3 minutes. Then add the kidney and fry together until brown. Stir while the stock is gradually added; bone stock or the broth from boiled meat or meat extract in water can be used. Add salt and pepper. When boiling, remove any scum. Add the clove and herbs tied in muslin, and simmer over gentle heat for 2 hours. Skim occasionally.

Strain through a sieve into a bowl and leave until cold. Take off the fat and reheat the soup. Taste to see if it is sufficiently seasoned. Put back the pieces of kidney. Mix the flour with the ketchup and stir into it enough soup to make a thin liquid. Take the pot off the stove and stir in this liquid. Then bring to the boil and stir while boiling for 3 minutes.

LAMB CUTLETS.—6 or 8 cutlets from the best end of the neck, 1 egg, breadcrumbs, salt and pepper, a little nutmeg if liked, ½ oz. margarine, 1 tablespoonful flour, fat for frying, ¼ pint brown stock.

Mix a sprinkling of salt and pepper with the flour and the nutmeg, if you are using it, and dust the cutlets with this on both sides. Then dip the cutlets in beaten egg, seeing that every part is covered with it; cover them with breadcrumbs, patting them to make them adhere.

Make the fat hot in a pan, and as soon as a little thin blue smoke rises from the fat, put in the cutlets. Slacken the heat a little after 3 minutes and fry from 10 to 15 minutes. Drain on a sieve, and keep the cutlets hot.

Knead a teaspoonful of flour with the margarine to a paste. Drain off the fat from the frying pan, put in the kneaded margarine and flour, a pinch of salt, a sprinkling of pepper and the stock, and stir until it has boiled for 3 or 4 minutes. Strain.

Pile mashed potato in the centre of the dish and place the cutlets round. Serve the gravy separately.

LAMB, ROAST.—Gas Regulo Mark 7, Electricity 450° F.

Loin, leg, shoulder or best end of the neck are all good roasting joints.

The great point with lamb is to keep it moist during the cooking. It will need dripping or lard for basting and should be covered with greaseproof paper, removing it about 20 minutes before it is done, so that the joint is nicely browned. The time allowed should be 25 minutes to the pound and also 20 minutes over for a leg. Heat should be reduced as soon as the joint begins to brown. Serve with mint sauce.

LAMB, STUFFED WITH VEGETABLES.—2 lb. loin or breast of lamb, herb, sausage or mushroom forcemeat (see Forcemeats), ½ lb. small onions, 1 lb. young carrots, ½ pint shelled green peas, 1 teaspoonful flour, 2 rashers fat bacon, 1 slice lemon, ½ pint milk or cream, salt and pepper.

Bone the lamb or ask your butcher to do so. Put it skin downwards on a board and spread the forcemeat over it, roll up and secure with tape or small skewers.

Put the bones into a stewpan with the onions peeled and the carrots scraped, then add ½ pint of water. Rub the lamb well over with cut lemon and lard it with the bacon. Place it on the bones in the stewpan, season well with salt and pepper, cover closely and cook gently for 2 hours, adding the peas 20 minutes before it is done.

Take out the lamb and keep it hot. Strain the liquor into a bowl, skim it and put it in a saucepan, letting it boil quickly until it is reduced to a gill. Mix the flour smoothly with a little cold water, stir it in and continue stirring until it has boiled for 5 minutes; then stir in the cream or milk made very hot, but do not let it boil again. Pour this over the lamb and garnish with the vegetables.

LAYER CAKE, ALMOND.—4 oz. self-raising flour, 3 oz. castor sugar, 4 oz. margarine, 2 eggs, almond essence, 1 oz. sweet almonds, ½ lb. icing sugar, white of 1 egg.

Gas Regulo Mark 5, Electricity 400° F.

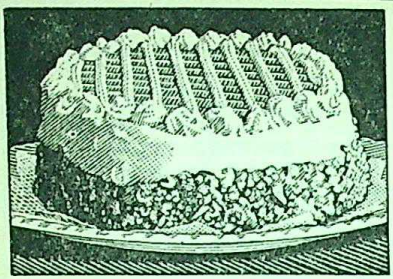
Beat the margarine and castor sugar to a very soft cream. Beat the eggs until they are frothy and add ½ teaspoonful almond essence to them. Then beat into the margarine the flour and eggs, adding a little of each alternately and beating well all the time to a very smooth batter. Turn into a well-greased deep sandwich tin and bake about 40 minutes in a moderate oven.

Turn it on to a wire tray or sieve when it has cooled a little and leave until quite cold—in fact, it is best made a day before it is iced.

Cut evenly through the centre and sandwich with a layer of almond icing (see recipe). Blanch the sweet almonds and chop them finely and put them in the oven until slightly brown. Rub the icing sugar through a sieve and form a soft paste with whipped white of egg. Flavour with

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



You may just cover an almond layer cake with icing and scatter the almonds on top

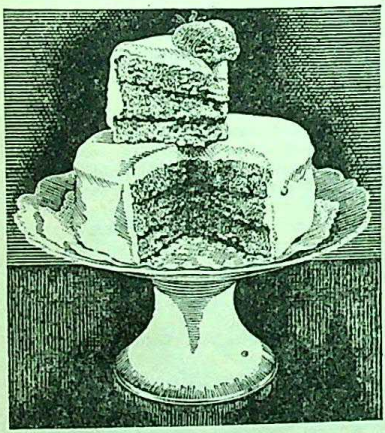
almond essence. Spread a thin layer round the cake and scatter the almonds on it. Pipe icing across the top, forming rosettes at the edges.

LAYER CAKE, STRAWBERRY. — Sponge cake, strawberry jam, 1 gill cream, boiled icing.

Make a large sponge cake (*see* SPONGE CAKES) and bake it in a rather deep round tin; leave it until next day. Then cut it through twice so that it makes three layers.

Whip the cream until it is quite stiff. Spread the sponge-cake layers with strawberry jam mixed with the cream and put them together again.

Then cover the whole with boiled icing (*see* ICING, BOILED) and leave for some hours, or until the following day, to set.



Cream may be omitted from the filling as shown in this illustration, if it is found desirable to have a less elaborate cake

LEEKS, BOILED.—Leeks are a very wholesome vegetable and most useful for flavouring other dishes.

Cut the roots off the leeks and remove the outside leaves, and cut away some of the green part, then split them down one side to enable the water to get to the centre. Wash the leeks under a tap, then put them into a bowl of cold water and leave until they are to be cooked.

Have ready a saucepan of fast boiling water with a teaspoon of salt to a quart of water, and boil until tender; then drain and press. Serve with plain hot butter or white sauce.

LEEKS WITH CHEESE.—Boil the leeks and drain them well. Cut them in 2-inch lengths and put them in a greased casserole. Cover with white sauce mixed with 2 oz. finely grated cheese. Sprinkle more cheese on the top and cook under a hot grill until the surface has turned a medium brown.

LEMON CURD (MOCK).—1 lb vegetable marrow without peel or seeds, 2 oz. fresh butter, 1 large juicy lemon, 1 lb. loaf sugar, salt.

Put the marrow in boiling water with 1 small teaspoonful of salt to 1 quart of water, and boil until quite tender. Strain off the water and turn the marrow on to a sieve; leave it until it has ceased to drip. Beat it to a smooth pulp, and put into a stewpan with the sugar. Mix in the yellow part of the lemon rind, finely grated, the strained juice and the butter. Stir over gentle heat till the butter has dissolved, then boil till it is a smooth paste. Store in small glass jars. When cold, cover with wax paper and then with parchment.

LEMON JELLY SPONGE. — 1 pint packet lemon jelly, ¼ lb. granulated sugar, 1 juicy lemon, ½ oz. isinglass, whites of 2 eggs.

Make the jelly, pour it into a quart mould and leave until set.

Put the sugar into a saucepan, add the strained juice of the lemon, half a pint of water and the isinglass.

Simmer gently for a quarter of an hour, then strain into a basin. Leave in a cold place and, as soon as it begins to set, whisk the whites of the eggs, add them to the mixture and beat briskly until it is thick, white and spongy. Wet the sides of the jelly mould with a cloth wrung out in cold water, and put the sponge on the jelly a spoonful at a time so as to avoid disturbing it. Smooth the top and leave for some hours to settle. To turn out, plunge the mould for a few seconds into hot water.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LENTIL SOUP.—1½ pints stock, salt and pepper, ¼ lb. lentils, 1 oz. margarine, 1 level tablespoonful flour, ¼ lb. onions, few sprigs of parsley, ½ pint milk.

Wash the lentils well, remove any black ones, cover them well with cold water and leave for a few hours or until next day. Then drain off the water, put the lentils into a stewpan with the stock (for stock you can use the water meat or a cereal has been boiled in), salt and pepper (if stock is unseasoned). Add the peeled and chopped onion, and bring to the boil. Skim and simmer until the lentils are quite soft—about 1½ hours. Rub through a sieve and return to the stewpan. Knead the butter and flour to a paste. Add to the soup in small pieces and stir until it has boiled for 2 or 3 minutes. Stir in the hot milk, and sprinkle in the parsley.

LIVER AND BACON.—1 lb. lamb's or calf's liver, 4 rashers fat bacon, ¼ pint stock, 1 tablespoonful mushroom ketchup or any good flavoured sauce, 1 tablespoonful flour, salt and pepper.

Gas Regulo Mark 5, Electricity 400° F.

Add a good sprinkling of salt and pepper to the flour, cut the liver in thin slices and sprinkle them with the seasoned flour. Fry the bacon, take it out of the pan and fry the liver in the fat from the bacon for a few minutes to brown it lightly on both sides. Put it in a casserole. Mix a teaspoonful of flour with the ketchup and add the stock. Pour it into the pan and stir until it has boiled for 2 minutes. Pour this on the liver and bake in a moderate oven until the liver is quite tender. Put the bacon round the liver about 5 minutes before it is done.

LOGANBERRY JAM OR JELLY.—6 lb. ripe loganberries, ½ pint water, 1 lb. sugar to every pint of juice or pulp.

Put the fruit into a preserving pan, add water, and simmer over low heat until quite soft.

If you are making jelly, turn it on to a fine hair sieve and leave it until it has ceased to drip. Move it lightly now and then with a wooden spoon to help the process, but do not press it.

If a seedless jam is preferred, press the fruit through a sieve just fine enough to keep back all the seeds. Put your juice or pulp in a preserving pan with the sugar and boil until it sets when tested—30 to 45 minutes. Store in the usual way.

MACARONI CHEESE.—½ lb. macaroni, 1 oz. margarine, 1 tablespoonful flour, ½ pint milk, ¼ lb. cheese, salt and pepper, 1 saltspoonful made mustard.

Break the macaroni into pieces about 2 in. long and boil until tender in salted water. Drain through a colander and keep hot while making the sauce. To do this melt the margarine in a small saucepan and add the flour, working it smoothly into the margarine. Stir in the milk, and cook until it has boiled for 2 minutes, being careful to avoid any lumps. Add the finely grated cheese, reserving a little for the top, and the mustard and salt and pepper to taste. When just on boiling point, pour it over the hot macaroni. Mix well and sprinkle the top with more grated cheese. Brown under a hot grill and serve at once.

MACARONI PUDDING.—1 pint milk, 2 oz. macaroni, pinch of salt, 1 egg, flavouring of grated lemon or orange rind or vanilla essence.

Gas Regulo Mark 4, Electricity 375° F.

Break the macaroni into short pieces, put them in a saucepan with the salt and enough boiling water to cover well, and boil very gently for ten minutes. Strain off the water and add the milk, then simmer until it is tender. Stir several times while it is cooking to prevent the pieces sticking to the bottom of the saucepan. Let the macaroni cool a little, then add the flavouring and a well-beaten egg. Grease a pie dish, turn the mixture into it and bake until nicely browned in a very moderate oven. If too hot the pudding will curdle.

MACKEREL, BOILED.—2 or 3 mackerel, 1 carrot, 1 onion, 1 bay leaf, sprig of thyme and marjoram, 3 peppercorns, salt, 1 tablespoonful vinegar.

Wash and prepare the mackerel, and slice thinly 1 carrot and 1 onion. Put these into the fish kettle with the herbs, peppercorns and bay leaf, and lay the fish on top. Pour over enough cold water just to cover them, and add the vinegar and a little salt. Bring to the boil, skim and then simmer gently until the skin loosens on the fish—10 to 15 minutes. Take it out carefully and place it on a hot dish. Serve with parsley or fennel sauce.

MACKEREL, GRILLED. — Wash and split the fish and remove the centre bone. Brush it over with warm dripping, sprinkle with a little pepper, and cook for about 10 minutes under a moderately hot grill, skin side downwards. Sprinkle with finely chopped parsley or chutney; serve at once.

MACKEREL, SOUSED.—2 or 3 mackerel of medium size, 1 breakfastcupful vinegar, 3 whole peppers, 3 allspice, 1 very small piece of whole ginger, 1 small teaspoonful salt.

Wash and clean the mackerel, put them

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

into a saucepan and well cover with cold water. Add the salt and a tablespoonful of vinegar. Strain and bring to the boil, then simmer for five minutes. Leave until cold, then remove the backbone. Put the mackerel into a stewpan with half a pint of water, spices and the remainder of the vinegar. Simmer for 10 minutes. Cool, put the fish into a deep dish or tureen; pour the liquor over, and leave until required. When ready, lift out the fish, place them on a dish and garnish with parsley.

MARMALADE, GRAPEFRUIT.—4 lb. grapefruit, 2 large lemons, 10 lb. preserving sugar.

Remove the peel from the grapefruit and slice it as finely as possible. Take out the pips from the fruit, also the pips from the lemons, and put them to soak in a pint of cold water.

Cut the grapefruit into very small pieces, put them in a bowl with the peel; peel the lemons and cut the fruit into very small pieces, but do not use any lemon peel. Add the lemon to the grapefruit, cover with 5 pints of cold water, and leave for 24 hours.

Then place over gentle heat, add the strained water from the pips, and simmer until the peel is tender—about half an hour. Add warmed sugar and boil until it sets when tested. Turn into dry, warm jars.

MARMALADE, LEMON.—6 lb. juicy lemons, 6 lb. sugar, 3 quarts water.

Wash the lemons and rub them well with a cloth. Put them into a pan, well cover them with cold water and boil slowly until the peel is quite soft. When cool, take them out and cut them in the thinnest possible slices, removing all the pips.

Put the sliced lemons back in the preserving pan with a pint of the water in which the lemons were boiled, and 1 lb. of sugar to every pound of fruit.

If the water in which the lemons are boiled is not sufficient, make up with plain water. Boil gently until the marmalade jellies when tested (about 1 hour). Store in the usual way.

MARMALADE, ORANGE.—6 lb. preserving sugar, 6 large, juicy Seville oranges, 2 juicy lemons.

If the oranges are small, use 8.

Wash the fruit and dry with a cloth, removing any black specks. Take off the rind in quarters, first cutting it through with a sharp knife. Then cut the rinds into the thinnest possible shreds.

Next open the fruit and take out all the pips. Put them into a basin and pour a pint of cold water over them.

Cut the fruit into small pieces with a stainless knife and put it into a preserving-pan with the juice that flowed from it. Add the shredded peel and cover with cold water. Leave for 24 hours.

Then, to the fruit in the pan, add the strained water from the pips and boil gently until the rinds are quite tender. Add the sugar and boil until the jam jellies when tested. Remove any scum. Pour into warm jars and tie down when cold.

MARMALADE PUDDING.—Stale bread and margarine, 1 pint custard, 1 tablespoonful marmalade.

Grease a quart-size mould, cover the bottom with a thin coating of marmalade; add a layer of thin slices of bread and margarine. Repeat the layers until the mould is rather more than three-parts full. Then pour into it a pint of custard made with custard powder. Leave it to soak for two hours. Then cover the mould, and steam for 1½ hours.

MAYONNAISE.—Yolk of 1 fresh egg, salt and pepper, 1 small teaspoonful made mustard, 1 dessertspoonful vinegar, olive oil.

When making mayonnaise the important point to remember is that the oil must be added drop by drop. First put the salt, mustard and pepper into a perfectly cold basin, then add the egg yolk unbeaten. Stir with a wooden spoon until well mixed. Next add the oil, dropping it in drop by drop and stirring with the wooden spoon all the time. Continue the process until the mixture looks like creamed butter—it will need rather more than a quarter of a pint of oil. Then add the vinegar very gradually. Store in a very cool place.

MEAT.—To Boil.—When boiling meat, as in roasting, we want to keep the flavour in the meat. Therefore it must be plunged into fast boiling water and boiled slowly for 5 minutes, then allowed just to simmer *gently* until it is sufficiently cooked. This applies to all fresh meat.

Salted meat is the exception. This is placed in cold water, brought to boiling point, and simmered until done.

It is important that after the first 5 minutes meat shall not boil, but only just simmer; but it must keep simmering all the time—that is, the water just moving gently all over the surface. Otherwise it becomes hard.

Serve boiled meat very hot with a little of the broth round it and the vegetables which were cooked with it.

To Braise.—Braised meat is rich in flavour, for all the goodness is retained.

The meat is first dusted very sparingly with flour. Then put 1 oz. of dripping

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

into the pan, put in the meat, some vegetables cut in small pieces, and a sprig of parsley, thyme and marjoram. Brown the meat quickly on both sides. Then add half a pint of stock or water, a quarter of a saltspoonful of salt and a sprinkling of pepper. Cover closely and cook slowly over gentle heat until the meat is quite tender.

Put the meat on a hot dish with the vegetables round as garnish. Keep very hot. Boil the gravy quickly until it is reduced to about half a teacupful. Pour it round the meat and serve. Alternatively, the meat, after browning in a frying pan with the vegetables, can be finished in a casserole in the oven. Cook it gently until the meat is quite tender, and serve it in the casserole.

To Fry.—For meat such as chops, steaks and cutlets, grilling is a far better method than frying. The latter should be employed only when the meat is fried in batter or egg and breadcrumbs (*see* FISH), except in recipes where meat is browned before being cooked in a stew or casserole.

To Grill.—See that the gridiron is perfectly clean, grease it well, then heat it and rub off the grease with kitchen paper.

If you are using a gas or electric griller, light it 5 minutes before you are ready.

Well grease the gridiron, put on the steak, or whatever you are grilling, and let it be fairly close to the heat for the first 4 minutes to harden the albumen and keep in the juices. Then slacken the heat a little.

When sufficiently cooked one side, turn with a pair of grilling tongs or a fish slice —never stick a fork into meat that is being grilled, or the juices will run out. Serve, immediately the meat is done, with any gravy that comes from it. Time to grill a chop or steak 1½ inches thick: 5 minutes on each side.

To grill a sausage, allow 10 minutes, turning three or four times in the process. For a kidney, allow 3 minutes for each side. Serve at once on a very hot dish.

To Roast.—To keep the goodness in when roasting meat, the joint must be put into a hot oven, temperature Gas Regulo Mark 7, Electricity 450° F., and the heat maintained until it begins to brown. This hardens the albumen and keeps the juices in the meat. Afterwards slacken to a moderate heat. Basting is important. If a joint is not basted, it will be dry and flavourless. Baste about every 15 minutes.

Increase the heat when the joint is nearly done if it is not sufficiently brown; if, on the contrary, it is becoming too brown, cover with greased paper until done. A roast joint must be served very hot; have the dish, plates and tureen well heated.

MEAT PUDDING.—This makes a good, nourishing pudding with a small quantity of meat. ½ lb. cooked meat, 2 oz. rice, ½ pint milk, 1 egg, 1 rasher bacon, salt, pepper, mustard (with beef), 1 onion, 1 breakfastcupful mashed potato.

Cut up the meat and the bacon rasher and put them through a mincer. Put rice, milk and half a pint of water into a saucepan, add the onion finely chopped, and simmer until the rice is tender. Season with salt, pepper and mustard if liked. Add a well-beaten egg and stir to mix. Season the minced meat and put it into a greased pie dish. Cover with the rice, then with mashed potato, and bake in a moderate oven for half an hour until nicely browned.

MINCEMEAT.—½ lb. each very finely chopped suet, currants, raisins, sultanas and peeled, cored and chopped apples, 1 lb. sugar, 3 oz. candied peel, 2 tablespoonsful orange marmalade, 2 teaspoonsful mixed spice, grated rind and the juice of 1 lemon, 1 glass of rum.

Mix the ingredients well together and let them stand for 24 hours before packing them in pots for keeping. Then press into jars and cover closely.

MIXED GRILL.—For each person: 1 mutton cutlet or 2 small, 1 sheep's kidney, 2 chipolata sausages, 1 tomato, 1 rasher bacon, small piece butter.

Skin the kidney and cut it open; trim off any superfluous fat from the cutlets. Put sausages, kidney and cutlets on a shallow tin with a scrap of butter on each cutlet and the kidney.

Place under a hot grill. They will take 3 to 4 minutes on each side; when turning them, do not stick a fork in but turn with 2 forks or grilling tongs.

A minute or two before they are done, put in the bacon and the halved tomato.

Serve immediately they are ready, with just the gravy that came from them.

Chipped potatoes, served piping hot, are very good with a mixed grill.

MOCK CREAM (1).—2 oz. fresh margarine, 1 large teaspoonful castor sugar, 1 tablespoonful dried milk.

Beat the margarine till creamy, add the sugar and dried milk very gradually, and continue beating until it is a smooth cream. Add flavouring essence if liked.

MOCK CREAM (2).—1 oz. margarine, 1 tablespoonful castor sugar, dried milk.

Melt the sugar and margarine in 1 tablespoonful of hot water. Then very gradually add enough powdered milk to form a thick cream. Add very little at a time and beat as you add it, to make perfectly smooth.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MUSHROOMS.—It is easy to distinguish good mushrooms. They are known by their firm, white stems, pink gills, and also by the fact that they will peel without any trouble. Never overcook mushrooms, and never on any account re-cook them, as this hardens them and makes them leathery. The wild ones are far superior to those which are cultivated.

MUSHROOMS WITH BACON. — 4 rashers rather fat bacon, ¼ lb. mushrooms, squares of buttered toast, salt and pepper.

Peel and wash the mushrooms. Fry or grill the bacon lightly and keep it hot. Put the mushrooms, quite wet, in the fat from the bacon, sprinkle with salt and pepper (be sparing with the former if the bacon is salt), put them in a pan, cover and simmer for about 10 minutes until the mushrooms are tender. Remove the cover after they have cooked for 5 minutes. Arrange the bacon on the toast. Put some mushrooms on each, pour the mushroom liquor over and serve at once.

MUTTON CUTLETS. — Many delicious savoury dishes can be made with mutton or lamb cutlets.

Plainly grilled they are very good with a surround of green peas and tomatoes, or mushrooms stuffed with forcemeat and baked make an excellent accompaniment.

About 2 lb. neck of mutton, sausage forcemeat, 4 rashers fat bacon or 4 slices fat from boiled bacon, mashed potatoes.

Trim off any superfluous fat from the cutlets and brown them in a frying pan on one side only. Put them on a plate and leave until cold. Then cover the browned side of each cutlet with a layer of sausage forcemeat and cover this with a piece of fat bacon. Tie it on with thin string. Grease a tin, put in the cutlets and bake in a hot oven 10 to 15 minutes according to their thickness. Serve them round a mound of mashed potatoes.

For gravy, mix a teaspoonful of flour with a dessertspoonful of tomato ketchup, add a quarter of a pint of stock, put it into the tin the cutlets were cooked in, and let it boil a minute or two, stirring all the time. Strain and use.

OATMEAL SCONES. — ¼ lb. medium oatmeal, ¼ lb. flour, 2 oz. margarine, 1 saltspoonful salt, 1 teacupful milk and water mixed.

Gas Regulo Mark 7, Electricity 450° F.

Mix together the salt, oatmeal and flour. Rub in the margarine and add milk and water to make a stiff dough. Knead this dough for 5 minutes. Form into scones, and bake on hot tins for about 20 minutes.

OMELET.—Omelets are not difficult to make if a few rules are remembered: an omelet must be eaten as soon as possible after it is made and eggs must be fresh.

A frying pan should be kept entirely for omelets. After using, rub off any grease; take this off with a clean cloth and keep the pan dry.

2 eggs, sprinkling of salt and pepper, 1 tablespoonful water, 1 oz. butter or dripping.

Beat the eggs just long enough to mix yolks and whites. Add the water, salt and pepper. Melt the fat in the omelet pan and, when it is piping hot, turn the eggs into it. As soon as the omelet begins to set, loosen the edges with the point of a knife, to enable the liquid part to run under. Then tilt the pan and fold over to form a crescent shape. Slide the omelet on to a hot plate and serve immediately.

OMELET, FLUFFY.—Beat the yolks of the eggs with the water, salt and pepper, whisk the whites well, then mix yolks and whites together.

Finely chopped cooked ham or tongue or grated cheese may be put on the omelet before it is folded over to form the crescent shape.

OMELET, HERB.—Add a little finely chopped parsley and thyme to the yolks of the eggs.

ONION SAUCE.—Boil 2 medium-sized onions in water until soft. Drain and press well and chop them finely. Put them in half a pint of well-seasoned white sauce. Reheat and serve.

ONIONS, PICKLED. — The little silver onions make the daintiest looking pickle. Peel any quantity of onions, and put them into vinegar as you peel them, to preserve the colour. Strain the vinegar and put it in an enamelled stewpan with 2 teaspoonsful of salt, 1 oz. of peppercorns and a small piece of whole ginger to every quart of vinegar. Let it boil well for 5 minutes, then put in the onions and boil slowly for 2 minutes. Bottle when quite cold.

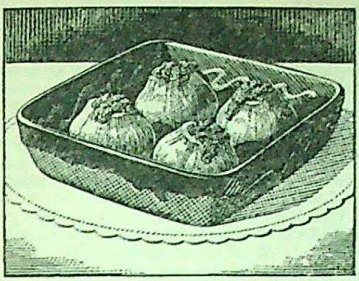
Shallots can be pickled in the same way.

ONIONS, STUFFED.—4 large Spanish onions, 2 sausages or ¼ lb. sausage meat, ½ teaspoonful finely chopped parsley, 1 teaspoonful tomato or Worcester sauce, 1 oz. dripping.

Peel the onions and boil them for 5 minutes. Leave until cold. Then carefully scoop the centre out of each onion, chop it finely and mix it with the parsley,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Tasty meals are obtained if onions are stuffed as described in this recipe

sausage meat and the sauce. Fill the centres of the onions with this mixture. Pack them in a well-greased casserole close together, put a little dripping on each and bake until the onions are quite tender. Serve in the casserole.

ORANGE PUDDING.—¾ pint milk, 1 large breakfastcupful fine breadcrumbs, 2 oranges, ½ lemon, 4 oz. granulated sugar, 1 tablespoonful orange marmalade, 2 oz. margarine, 2 eggs, castor sugar.

Put the breadcrumbs in a bowl with the margarine in small pieces. Bring the milk to boiling point, pour it over the breadcrumbs and leave them to soak until cold. Whip the eggs well, mix them with the granulated sugar, beat them together for 2 or 3 minutes, and stir them into the soaked breadcrumbs. Add the grated rind of one orange, the marmalade, strained juice of the oranges and lemon, and mix all well together. Turn into a greased mould and steam for one hour. Turn out, sift castor sugar over and serve.

PANCAKES.—4 oz. flour, 2 eggs, pinch of salt, ¼ pint milk.

Beat the yolks and whites of the eggs separately, put them both in a bowl, add the salt and very gradually beat in the flour. Beat in the milk very slowly, and continue beating for 5 minutes after all has been added. Leave for an hour, giving an occasional stir to the mixture.

Use a small, clean, dry frying-pan. Make it quite hot. Put in a piece of lard or butter—about ½ oz. When the fat is hot, pour in enough batter to cover thinly the bottom of the pan. Cook gently, loosening the sides with the point of a knife. When brown on one side turn with a fish slice or toss it. When done, turn on to soft white paper for a moment to drain. Roll up.

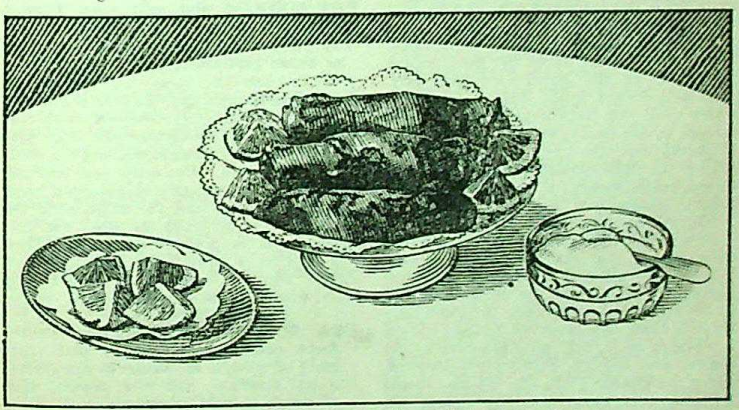
PASTRY, CHOUX.—2 eggs, 4 oz. flour, salt, 2 oz. margarine, ¼ pint water.

Gas Regulo Mark 5, Electricity 400° F.

Mix a little salt with the flour. Put margarine and water in a saucepan and, as soon as it boils, take it off the stove and stir the flour in quickly. Now stir over gentle heat until it is a thick dough that leaves the sides of the saucepan. Take off the fire and drop in an unbeaten egg, beat until thoroughly blended and repeat with the second egg.

Have ready a baking sheet that has been greased previously, and press the paste through a forcing bag in long strips for éclairs; or put pieces of the dough in patty pans for cream buns.

When cold, split the éclairs open and



Serve pancakes as soon as they are ready, with lemon and sugar or jam

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fill with any savoury mixture of a creamy nature. For a sweet course, fill them with custard or cream.

PASTRY FOR GENERAL USE.—This is not as rich as puff pastry, but is a good light pastry for general use, and quickly made. ½ lb. self-raising flour, 3 oz. margarine, 2 oz. lard, good pinch of salt, skimmed milk or milk and water.

Gas Regulo Mark 7, Electricity 450° F.

Mix the salt with the flour. Then rub in lightly 2 oz. margarine and 1 oz. lard; when thoroughly mixed, form a dough with milk or milk and water. The dough should be soft enough to roll quite easily but not in the least sticky. Roll it out rather thinly on a well-floured board. Put on it the remainder of the margarine in small scraps. Fold over and roll out; repeat this with the rest of the lard. Use at once.

PASTRY FOR RAISED PIE.—1 lb. flour, 4 oz. margarine, 4 oz. lard, ½ teaspoonful salt, ¼ pint milk.

Gas Regulo Mark 4, Electricity 375° F.

Mix the salt with the flour and sift them. Rub the lard into the flour. Cut margarine in small pieces, put them in a saucepan, add the milk and stir it over moderate heat until the butter has melted. Pour this into the flour and mix to a stiff paste. Roll out, fold, roll out again and use at once before it is cold.

PASTRY, PUFF.—½ lb. butter or margarine, ¾ lb. flour, pinch of salt, yolk of 1 egg, small teaspoonful lemon juice.

Gas Regulo Mark 9, Electricity 500° F.

Add the salt to the flour and sift it into a bowl. Put the egg yolk in a cup or small basin with two tablespoonsful of very cold water and the lemon juice. Whisk them well with an egg-whisk for 2 or 3 minutes. With this mixture form the flour into a paste, adding the liquid very gradually. Mix well with a knife, adding more cold water until you have a paste that is soft enough to roll easily, and not at all sticky. It should leave the basin quite clean when it is of the right consistency. If too wet it means tough pastry; if too dry it will be heavy, because you will have to use too much pressure when rolling it.

Next divide the butter or margarine into three pieces, dip each in flour and roll it out to a rather thin sheet on a floured board. Next roll out the pastry, making it a full inch larger, both in width and length, than the sheet of butter. Place the butter on it, fold all sides over to the centre, and roll out lightly; roll forward, never backward. All the rolling should be done one way. Use the rolling pin lightly, and always stop before you get to the edge of the paste. This is to keep the air in the pastry. Leave, wrapped in a cloth, for 10 minutes, then repeat with the remaining two portions of butter or margarine, leaving 10 minutes between the rollings. Puff pastry should be made an hour before it is used.

PASTRY, SHORT.—8 oz. flour, 4 oz. lard or half lard and half margarine, pinch of salt.

Gas Regulo Mark 6, Electricity 425° F.

Add the salt to the flour and put through a sieve. Then rub in the fat lightly with the tips of the fingers until there is no plain flour left in the basin. Add just enough water to form a dough that will roll easily, but it must not be at all sticky. Roll out and use.

PEASE PUDDING.—½ lb. split peas, 1 oz. margarine, salt and pepper.

Wash the peas thoroughly and discard any black ones. Soak them in cold water overnight. Then put them in a cloth and tie rather loosely so that they have plenty of room to swell. Put them into boiling water with half a teaspoonful of salt. Then boil quickly until they are tender—about 2½ hours. Take them out of the cloth and rub them through a coarse sieve. Season with salt and pepper, then tie tightly in a cloth and boil for another half-hour. If the pudding is to be served with boiled pork or other boiled meat, it should be put in with the meat for the second boiling, as the broth will very much improve the flavour. If, however, the pudding is to be served alone, add the margarine after rubbing the peas through the sieve.

PEA SOUP.—½ pint split peas, 1 piece of celery, 1 carrot, 1 onion, 1 clove, 1½ pints stock, 1 small slice lean ham or bacon (optional), ½ pint milk.

Well wash the peas, discarding any dark coloured ones that float on the water. Put them into a bowl, cover well with cold water and leave until the following day.

Clean the celery and carrot and cut them into small pieces. Drain the peas and put them in a stewpan with the chopped ham, the celery, carrot and the onion with the clove stuck in it. Add the stock and boil gently until the peas are quite soft. Then rub through a sieve. Put the soup back in the stewpan, add half a pint of hot milk, bring almost to the boil and serve.

PEA SOUP, GREEN.—½ pint shelled green peas, 1 pint stock, 1 pint milk, sprig of mint, 1 oz. butter or margarine, ½ oz. cornflour, salt and pepper, slice of bread, a little dripping.

Well wash the pods and put them into a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stewpan with the stock. Simmer for half an hour. Strain and return the stock to the stewpan, put in the peas and mint, and simmer until tender. Then rub through a sieve. To the sieved peas add the butter or margarine, the milk mixed with cornflour and a good sprinkling of salt and pepper. Stir until it has boiled for a good 5 minutes. Cut a slice of bread into tiny squares, fry until crisp in dripping, and serve with the soup.

PICCALILLI. — Small onions, shallots, little green tomatoes, runner or french beans, cauliflower, marrow, cucumber, nasturtium seeds—in fact, any vegetable can be used. To every quart of vinegar allow 1 oz. mustard, ½ oz. turmeric powder, 2 oz. castor sugar, 1 teaspoonful mixed whole spices, 1 tablespoonful cornflour.

Peel the onions and shallots, string the beans, stalk the tomatoes, remove the leaves from the cauliflower and wash it well. Peel the marrow, remove the seeds and peel the cucumbers. Cut up all the vegetables into small pieces and put them into a bowl and sprinkle with salt—about a dessertspoonful to a quart of vegetable. Do this overnight and leave them until next day. Have sufficient vinegar ready to cover the vegetables. Mix the turmeric with the vinegar and place the sugar, mustard and the spices in a little muslin bag. Add the vegetables and boil all together for 10 minutes. Then mix the cornflour with a little vinegar to make a thin paste, let the vegetables cool a little, take out the spices, stir in the cornflour and boil for 4 minutes, stirring all the time. Then bottle. It is important that the bottles shall be dry and scrupulously clean. Cork securely to make quite airtight.

PLUM JAM.—(*See* GREENGAGE.)

PORK.—Roast pork is served with sage-and-onion stuffing and apple. If the crackling is preferred crisp, brush it over with olive oil before cooking. (*See also* MEAT.)

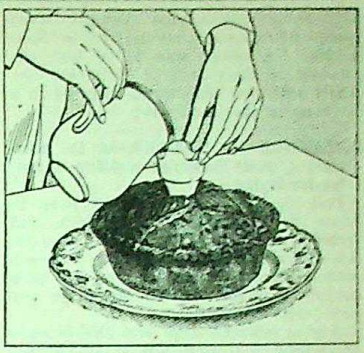
PORK OR PICNIC PIE.—For the filling: about 1 to 1½ lb. lean pork, 6 sage leaves, 1 teaspoonful salt, a good sprinkling of pepper, a little beaten egg (dried egg made liquid with water will do).

Gas Regulo Mark 4, Electricity 375° F.

Cut the meat into very small cubes and chop the sage finely.

Use the pastry while it is still warm, kneading it well first. If you have not a pork pie mould use a round cake-tin.

Line the bottom and sides, moulding the paste well in. Reserve the remainder of the pastry for the top, placing it in a cloth to keep it warm, as it must be still warm when placed in the oven. Now fill the mould with the pork, cut in cubes. Sprinkle the salt, pepper and sage between the layers of meat. Pack the meat in closely, because the pie must be quite full.



Correct method of adding stock to pie

Do not add any water. Place on the pastry cover, press at the edges, decorate with fancy leaves of pastry, and brush over with beaten egg. Make a hole in the top and bake in a slow oven. It will need 2 hours in a moderate oven. When cold, a little good stock made from pork bones may be poured into the pie through a funnel. If it is not strong enough to jelly, dissolve a little powdered gelatine in it.

POTATO-AND-ONION PIE.—1 lb. onions, 1½ lb. potatoes, 1 oz. dripping, salt and pepper, 2 oz. cheese.

Gas Regulo Mark 7, Electricity 450° F.

Steam and mash the potatoes. Peel and slice the onions very thinly, fry them in the dripping until nicely browned and season well with salt and pepper. Put a layer of mashed potato in a greased pie-dish, then a layer of onion, another thin layer of potato and the remainder of the onion. Add the cheese—finely grated—to the potato that is over and pile it on the top, roughing it with a fork. Bake to a golden brown in a hot oven. Serve with gravy.

POTATOES.—To obtain the most nourishment potatoes should be cooked in their jackets. For steaming or baking scrub them very thoroughly. They should be served very hot, so if you have to steam a large quantity, when they are cooked put them back in the steamer as you peel them, to keep hot. A moderate heat only is required when baking potatoes to ensure

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

their being well cooked through; when baked, potatoes may be served in their jackets. A quick way is to boil the potatoes in their jackets until they are nearly soft, and then finish them off in a hot oven in the usual way.

POTATOES IN BATTER.—1 lb. potatoes, ¼ pint Yorkshire pudding batter, fat for frying.

Peel the potatoes thinly, cut them in cubes, dry thoroughly in a cloth, and sprinkle with a little salt. The batter for this dish should be rather thick. Dip each potato cube in the batter, then fry to a golden brown in smoking fat, drain and serve very hot.

A good sauce to serve with this is made by adding a dessertspoonful of chopped capers to a teacupful of mayonnaise.

POTATOES, NEW, TO BOIL.—New potatoes should be cooked as soon as possible after they are taken from the ground. Wash them well and scrape off the skins. Have ready a saucepan of boiling water to which a little salt and a spray of mint have been added. Put in the potatoes and allow them to cook gently until they are nearly tender. This will take from 15 to 20 minutes. Drain them, put them into a saucepan with a little margarine, and cook for a few minutes longer. Sprinkle with finely chopped parsley, and serve very hot.

POTATO SCALLOPS.—1 lb. cooked potatoes, ½ pint white sauce, ¼ teaspoonful anchovy essence, 1 teacupful breadcrumbs, ½ oz. margarine or butter or dripping, 1 oz. cheese.

Gas Regulo Mark 6, Electricity 425° F.

Cut the potatoes in thin slices and use them to fill greased scallop shells. Make the white sauce, adding the anchovy essence. Grate the cheese and mix it with the breadcrumbs. Cover the potatoes with sauce, sprinkle the breadcrumbs on the top, dot with scraps of fat, and bake in a hot oven for about 10 minutes.

POTATO SOUFFLÉ.—1 lb. floury potatoes, 2 eggs, 1 gill milk, salt and pepper, 1 oz. margarine, grated cheese.

Gas Regulo Mark 6, Electricity 425° F.

Peel the potatoes and steam them until done. Rub through a sieve, taking sufficient to fill a pint basin. Melt the margarine. Stir it into the potato purée and beat until smooth and creamy. Beat the yolks of the eggs well, and the whites to a stiff froth. Stir the milk into the potato and season well with salt and pepper. Next stir in the yolks of the eggs, beat to mix, and lastly, gently fold in the stiffly beaten whites. Turn into a soufflé case or pie dish, and bake in a hot oven. Serve with grated cheese.

POTATO SURPRISE.—4 large potatoes, 2 sausages or minced meat.

Gas Regulo Mark 6, Electricity 425° F.

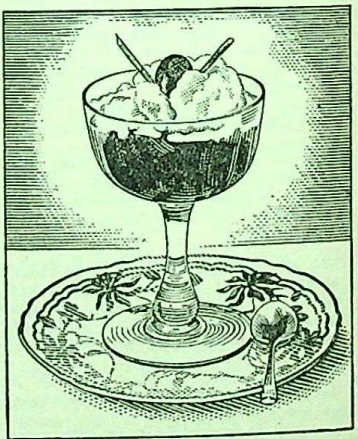
Bake the potatoes until half cooked, then cut them through the centre and scoop out some of the potato. Skin the sausages and put half a sausage in each potato. Put the half-potatoes together again and finish baking.

QUINCE JELLY.—8 quinces, 1 lb. preserving sugar to every pint of juice.

Wash the quinces and rub them well with a cloth. Cut them into small pieces without peeling them. Put them into a preserving pan and add just enough cold water to cover them. Bring slowly to boiling point, then simmer until they are quite soft but not mashed. Turn them on a hair sieve in a bowl and leave until the juice has ceased to drip. Strain the juice through muslin or a jelly bag. Measure it, put it into a preserving pan, and bring to the boil; boil gently for 10 minutes, add the sugar and boil until it sets when tested. Store as usual.

QUINCE JELLY CUPS.—Quince jelly, ½ lb. cooking apples, 1 dessertspoonful lemon juice, ¼ lb. castor sugar, white of 1 egg, a few glacé cherries (optional).

Peel, core and cut the apples into small pieces, put them in a stewpan with 2 tablespoonsful of water, cook gently and stir



Quince jelly cups are delicacies which may be made very quickly and economically when the necessary ingredients are available

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

until they are a soft pulp. Leave until cold. Then drain off any liquid, add the sugar and lemon juice to the pulp and the whipped white of an egg. Beat together until it is a thick white cream.

Break up some quince jelly and put some in each glass, then pile the apple mixture on the top. Decorate with glacé cherries and angelica if liked.

Apply jelly, or jelly of any other kind, can be used in place of quince, according to individual taste.

RABBIT.—Choose a young rabbit—that is, one with smooth and pointed claws, small white teeth and soft ears. Also, in young rabbits, you will find a small "nut" under the paws. Rabbits should never be hung but used while fresh, and paunched as soon as possible after they are killed.

Unless you are roasting it whole, cut it into neat joints and put them in a bowl, add a dessertspoonful of common salt and cover with cold water. Soak for several hours and wash in fresh cold water before cooking.

RABBIT BECHAMEL. — 1 rabbit, 1 onion, piece of celery, 1 carrot, ½ pint white sauce, salt and pepper.

Joint and soak the rabbit well. Slice the onion and cut the celery and carrot in cubes. Drain, and put the joints in a basin with the vegetables and a teacupful of water. Sprinkle with salt and pepper. Tie on a piece of greaseproof paper and steam until the meat is quite tender. Put the joints of rabbit on a dish or sieve to cool. Make the white sauce, using half milk and half the liquor from the rabbit. Leave until cool. Then coat the pieces of rabbit with the sauce and leave them in a cold place to set. Serve them on a green or potato salad garnished with beetroot.

RABBIT, BROWN.—1 young rabbit, 2 oz. unsalted margarine, 1 onion, ¼ pint brown stock, a few capers, 1 carrot, 1 tablespoonful flour, salt and pepper.

Soak the joints of a young rabbit, omitting the head and neck. Dry thoroughly, and dust with flour that has been seasoned with salt and pepper. Fry in the margarine until nicely browned. Take them out and fry a sliced onion of medium size, and a sliced carrot, until the onion is brown. Put back the joints and pour the stock over. Cover and simmer gently until the meat is quite tender—about 40 minutes. Dish the rabbit on a hot dish; skim any fat from the gravy, season it with salt and pepper, and pour it over the rabbit. Sprinkle with very finely chopped capers and serve immediately. Veal bone stock is good for this dish, or meat extract with water can be used.

RABBIT, FRIED, WITH PICCALILLI SAUCE.—1 young rabbit, 2 shallots, 1 small bunch sweet herbs (or pinch of dried herbs), 2 tablespoonsful salad oil, 1 tablespoonful vinegar, 1 egg, breadcrumbs, fat for frying, salt and pepper.

Joint and soak a young rabbit in salted water for 3 hours. Remove the bones, cut the meat into neat pieces, and put it in a pie dish. Chop finely the shallots and herbs, and sprinkle them on the meat (a good pinch of dried sweet herbs may be used in place of fresh ones). Add a good seasoning of salt and pepper, the salad oil and vinegar. Leave for 1 hour, turning the meat several times.

Now drain the rabbit, dry each piece, flour them, then dip in beaten egg and roll in fine baked breadcrumbs and fry in smoking fat. They will need 10 to 15 minutes, according to thickness. Drain and serve very hot with chipped potatoes and piccalilli sauce.

For the sauce, chop a tablespoonful of piccalilli very finely and add it to a gill of mayonnaise.

RABBIT PUDDING.—1 rabbit, ¾ lb. flour, ¼ lb. shredded suet, ¼ lb. lean pork, salt and pepper, 1 large onion, sprig of parsley.

Mix a good pinch of salt with the flour, stir in the suet and bring to the consistency of a rather soft dough with cold water.

Cut the pork into cubes. Line a greased basin with the pastry; put in the rabbit cut into small joints, distributing the pork and chopped parsley among them, and the onion finely chopped or grated. Sprinkle well with pepper and salt unless the pork is already salted. Add a small teacupful of water, cover with pastry, tie down and boil for 3 hours.

RABBIT, STUFFED.—When you are two in the family divide the rabbit, using the hind legs for this dish and the remainder for a stew or curry. 2 oz. dripping, celery-and-ham forcemeat, 1 teacupful brown gravy, ½ oz. butter or margarine, 2 rashers fat bacon, 1 teaspoonful flour, salt and pepper

Soak the hind legs of a young rabbit in salted water for several hours. Dry them, cut open, and remove the bones; spread a good layer of celery-and-ham forcemeat on each. Fold up, cover with fat bacon, shaping them to represent little birds, and tie round securely with fine string.

Melt the dripping in a small baking tin or casserole. Put in the "birds," place in a hot oven (temperature 450° F., Gas Regulo Mark No. 7), and bake for half an hour, basting several times during cooking. Place on a very hot dish, pour off all

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fat from the tin, add salt, pepper, the brown stock and the butter blended to a paste with a teaspoonful of flour. Stir until it has boiled for a minute. Serve very hot with chipped potatoes, Brussels sprouts and the gravy.

To Make the Stuffing.—Chop finely enough white celery to fill two tablespoons, add an equal quantity of chopped ham or bacon and fine breadcrumbs, 1 oz. dripping or butter and a good sprinkling of salt and pepper. Bind with the yolk of an egg and use.

RABBIT WITH SAUSAGE MEAT.—1 rabbit, ½ lb. pork sausages, ½ lb. onions, 1 tablespoonful flour, ½ pint milk, pinch of mace, a few sprigs of parsley, salt and pepper.

Gas Regulo Mark 4, Electricity 375° F.

A very nourishing dish, this, that will serve six persons. Put the sausages in hot water and simmer for 10 minutes. Cut the rabbit into joints and soak them. Mix a good sprinkling of salt, pepper and the mace with the flour. Dry the joints of rabbit and dust them with the flour. Skin the sausages and cut them in quarters. Peel and slice the onions. Put all these ingredients into a casserole or large pie dish, distributing them evenly, and sprinkle chopped parsley between the layers.

Mix the milk with half a pint of water and pour this in. Cover closely and cook in a moderate oven until the rabbit is very tender. This will require about 2 hours.

RHUBARB LAYER PUDDING — ¾ lb. self-raising flour, 3 oz. lard or margarine, a good pinch of salt, 3 big sticks of rhubarb, 3 oz. sugar.

First make the purée. Cut the rhubarb into small pieces, put them into a stewpan with a tablespoonful of water and the sugar and stir over gentle heat until the rhubarb is quite soft. Then rub through a sieve or mash with a fork and leave until cold. For the pastry, rub the lard into the flour mixed with the salt, and add enough cold water to form a dough. Roll out and cut into rounds with a small plate or saucer as guide. Put one into a basin, then a layer of rhubarb. Continue until all are used, finishing with pastry at the top. Cover with greased paper and steam for two hours. Turn out, sift a little sugar over, and serve.

RICE CUSTARD.—1 pint milk, 2 eggs, 1 oz. sugar, 2 oz. rice, 1 oz. butter.

Gas Regulo Mark 3, Electricity 350° F.

Boil the rice. Beat the yolks of the eggs and mix with them the sugar and milk. Stir the rice into the egg and milk. Use the butter to grease a pie dish. Turn the rice into it. Whip the whites of the eggs until frothy and stir them into the pudding. Finally, bake until set in a very moderate oven.

RICE PUDDING. — 2 tablespoonsful ground rice, 1 pint milk, 2 eggs, 1 oz. sugar.

Gas Regulo Mark 3, Electricity 350° F.

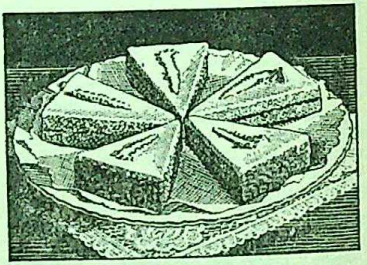
Grease a pie dish, mix the ground rice with the milk and simmer in a stewpan for 5 minutes. Remove the pan from the fire and stir in the sugar and well-beaten eggs. Turn into a greased pie dish and bake for half an hour in a slow oven.

SALAD DRESSING (see also Mayonnaise).—2 tablespoonsful salad oil, 1 tablespoonful vinegar, ½ teaspoonful made mustard, pepper and salt, pinch each of cayenne and sugar.

Mix together the salt, the pepper and mustard, and add the oil gradually. When these are well blended and the salt quite dissolved, add the vinegar, cayenne and sugar.

SANDWICH CAKES, ICED. — Sponge cake, jam or other filling, glacé icing.

Make a sponge mixture and bake it in a round sandwich tin. (*See* SPONGE CAKES.) When cold, cut it through and spread with a generous layer of jam or lemon curd or



Iced sandwich cakes are very pleasing if made to this recipe, and they also help to improve the decorations of the tea-table

a layer of jam mixed with imitation almond icing. Then ice the top with royal or other icing preferred and leave until set. Decorate with a piping of icing, tinting it with cochineal, and leave for some hours to set before using.

SEMOLINA BLANCMANGE. — 1 pint milk, 2½ oz. semolina, 1 oz. sugar, rind of 1 lemon.

Put the milk into a saucepan with the thinly peeled rind of 1 lemon. When boiling, take out the lemon rind and sprinkle in the semolina, and allow it to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

simmer until cooked. Add the sugar, and when thoroughly mixed, pour into a mould which has been rinsed in cold water. When set, turn out and serve with stewed fruit or jam.

SHORTBREAD. — ½ lb. plain flour, 1 tablespoonful ground rice, ½ lb. unsalted margarine or butter, good pinch of salt, 4 oz. castor sugar.

Gas Regulo Mark 3, Electricity 350° F.

Mix together flour, rice, salt and sugar and put them through a fine sieve. Slightly warm the butter without letting it get oily, rub it into the flour mixture until it begins to form a dough, then put it on a board and knead it as you would bread until it is quite soft and smooth.

Roll it out lightly and fairly thickly. Form or cut into squares or rounds, and bake on a greased tin in a very moderate oven until of a biscuit colour. Do not move it from the tins until it is cool, or it will break.

SHRIMP SAUCE.—To white sauce add half a teaspoonful of anchovy essence and 2 tablespoonsful of picked shrimps.

SPINACH.—Spinach must be used fresh and young. The leaves require very careful washing to rid them of all earth and grit, and after removing the coarser stalks, put the spinach in a saucepan, with just the water that hangs on the leaves. If the spinach is older, then a teacupful of water and a very slight sprinkling of salt will be needed. Cook until tender, stirring occasionally with a wooden spoon.

When ready, drain well, pressing out all the water. The spinach can then be served as it is, or it can be creamed in this way: rub it through a sieve or chop it very finely, melt about 1 oz. of butter or margarine in a saucepan. Put in the sieved spinach, season it with pepper, salt, a pinch of nutmeg and a squeeze of lemon juice and make it very hot over the fire. Serve on a hot dish.

SPONGE CAKE.—4 oz. flour, 4 oz. castor sugar, 4 oz. margarine or 2 oz. margarine and 2 oz. lard, 2 eggs, vanilla or other flavouring.

Gas Regulo Mark 5, Electricity 400° F.

Beat the fat and sugar to a very soft cream. Beat the eggs for 10 minutes and add the flavouring. Next, add just a little beaten egg and then a little flour to the fat-and-sugar mixture until all are used. Beat well all the time until it is a perfectly smooth batter. Turn into a well-greased tin. Smooth it at the top, making it rather lower in the centre than at the sides. Sift a little castor sugar over and bake about 1 hour in a moderate oven.

SPONGE CAKE (Economical).—5 oz. flour, 4 oz. castor sugar, 1 egg, 1 tablespoonful melted butter or margarine, ¼ pint milk, 1 teaspoonful bicarbonate soda, 1 small teaspoonful cream of tartar, pinch of salt, vanilla or other flavouring.

Mix the flour, salt and cream of tartar together. Beat the sugar and egg together until dissolved and creamy. Add the flavouring and then the bicarbonate of soda dissolved in the milk. Mix in the flour and stir well, and last of all add the liquid butter. Turn into a well-greased tin, sift a little sugar over, and bake as directed in the previous recipe.

STEAK-AND-KIDNEY PIE.—2 lb. lean steak, ½ lb. bullock's kidney, 2 eggs, ½ lb. mushrooms (optional), pepper and salt, 1 tablespoonful tomato ketchup, 3 dessertspoonsful flour, 1 oz. butter, flaky pastry, browning.

Mix together two dessertspoonsful of flour with half a saltspoonful of salt and half that quantity of pepper. Cut the steak and kidney into small pieces and dip each piece in the seasoned flour.

Put the meat in a stewpan with a saltspoonful of salt, a sprinkling of pepper and enough cold water to cover it. Bring to the boil, then simmer for 1½ hours.

Mix the ketchup with a dessertspoonful of flour, six drops of browning and two

Steak-and-kidney pie can be made a meal for several people without taking an exceptional amount of the housewife's time

tablespoonsful of water. Stir this into the meat and simmer 5 minutes longer, stirring all the time. Turn into a bowl and leave until cold.

Boil the eggs for 10 minutes and fry the mushrooms in the butter. Take a large pie dish and line the sides with flaky pastry, or short crust if you prefer it. Fill it with the meat, distributing the mushrooms among it. Slice the boiled eggs and place them on the top, and pour in enough gravy to fill half the dish.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Cover with pastry and make a hole in the centre. Decorate with pastry cut in fancy shapes. Bake in a moderate oven for about 1 hour. Ten minutes before it is done, brush over with beaten egg.

STEAK-AND-KIDNEY PUDDING.—1 lb. suet pastry, 1 lb. buttock steak, ½ lb. ox kidney, salt and pepper, 1 oz. flour. For flavouring, either 4 oysters, ¼ lb. tomatoes, ¼ lb. mushrooms or 2 large Spanish onions.

Well grease a basin and line it with the pastry, leaving a good margin of pastry round the edge. Mix with the flour a teaspoonful of salt and a quarter of a small teaspoonful of pepper.

Cut the steak into thin strips and the kidney into small pieces and dust them with the seasoned flour.

Oysters.—If you are using these, open them and carefully preserve the liquor, cut them into quarters and roll each in a piece of the steak.

Tomatoes. — Pour boiling water over them, leave a moment, then remove the skins.

Mushrooms.—Skin and slice them and fry for 5 minutes in a little dripping or margarine.

Onions.—Peel and slice.

Fill the lined basin with the meat, distributing the special flavouring among it. If oysters, sprinkle the liquor over the meat. Add enough cold water to come half-way up the basin. The meat must quite fill the basin and be piled up a little at the top, as it will shrink while cooking. Turn the edges of the pastry over the meat all round, then put on the top cover of pastry, wetting it with cold water at the edges to make it adhere. Cover the basin with greaseproof paper and then with a cloth, and boil for 3 hours.

STEAMED PUDDING, EGGLESS.—6 oz. self-raising flour, 3 oz. suet, 2 oz. sugar, ¼ lb. sultanas, 1 tablespoonful desiccated coconut, 2 tablespoonsful apricot jam or marmalade, ½ teaspoonful bicarbonate of soda, ½ pint milk, scrap of butter.

Shred the suet very finely. Mix with it the flour, sultanas, coconut and sugar. Stir in the jam and mix it evenly with the dry mixture. Dissolve the bicarbonate of soda in the milk and beat it in gradually to form a batter.

Butter a basin, fill it with the mixture, cover with greaseproof paper and a cloth and steam for 2 hours.

STOCK.—The stock pot should be in every household. Scraps of all kinds, except fish, can be put in—meat, vegetables, gravy, sauces, bones cooked or raw, water in which vegetables or cereals have been cooked. Cover all with cold water and remember that stock needs very slow cooking. The top of a kitchen boiler is ideal.

In cold weather it will keep a week providing it is reboiled every day; but in hot weather strain the liquid off each day and keep it in the refrigerator or the coolest place of storage available.

TOAD IN THE HOLE.—Yorkshire pudding batter, ½ lb. small sausages, or ½ lb. tender steak and a sheep's kidney, 2 oz. dripping.

Gas Regulo Mark 5, Electricity 400° F.

Make the batter at least 1 hour before you are going to use it. If you are making the toad of steak and kidney, you first cut them into small pieces. Make the fat hot in a fireproof dish, put the meat or the sausages in the dish, and pour the batter gently in. Put in a rather hot oven for about 40 minutes, reducing the temperature to a moderate heat after the first 20 minutes.

Serve immediately the toad in the hole is fully cooked.

TOFFEE, BUTTER. — ½ lb. Demerara sugar, 2 oz. butter, 1 tablespoonful golden syrup, 1 dessertspoonful vinegar, 5 tablespoonsful water.

Put syrup, sugar, butter, vinegar and water in a saucepan and stir until the sugar has dissolved. Then bring to the boil and, without stirring, boil to 290° F., or until a little tested in cold water will snap when broken. Pour into an oiled or buttered tin, and as soon as it begins to set, mark it in squares with the back of a knife.

TOFFEE, TREACLE.—1 lb. brown sugar, 1 lb. black treacle, 1 oz. butter, 1 dessertspoonful vinegar.

Put the black treacle into a saucepan with the sugar and butter and let it stand at the side of the fire until melted. Then stir until boiling, and boil to 300° F., or until it breaks crisp when a little is tested in cold water. Add the vinegar, pour the toffee on to an oiled tin, and mark in bars when it begins to set.

TOMATO-AND-GREEN-PEA SALAD.—Ripe tomatoes, cooked green peas, thick mayonnaise dressing, oil and vinegar, salt and pepper, lettuce leaves.

Cut a slice off each tomato and scoop out the centre. Mix the peas with the dressing and season well with salt and pepper. Fill the tomato cases with this mixture and serve on young lettuce leaves that have been tossed in oil and vinegar.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

TOMATOES, DEVILLED. — Very good with veal or mutton cutlets. 4 medium-sized tomatoes, 4 teaspoonsful curry paste, 1 oz. margarine or lard.

Well grease a small tin or fireproof dish, cut the tomatoes in halves and put them in the dish, cut side uppermost. Spread each one with curry paste, put a scrap of butter on each, and make very hot under a grill.

TOMATOES, STUFFED.—An excellent way to use a small quantity of meat or poultry: 4 large tomatoes, 4 tablespoonsful finely minced cooked ham or any other cooked meat or poultry available, 1 dessertspoonful finely chopped parsley, 1 oz. margarine, 1 egg, salt and pepper.

Gas Regulo Mark 4, Electricity 375° F.

Slice off the top of each tomato and carefully scoop out the centre without breaking the case.

Rub the tomato pulp through a sieve. Mix together the breadcrumbs, the tomato pulp and the minced meat, add a sprinkling of salt and pepper and the parsley, and bind with a well-beaten egg. Form this into four balls and put one carefully into each tomato case. Sprinkle a few breadcrumbs on each, and a little liquid margarine. Bake for 10 minutes.

TOMATO SALAD.—Rub the inside of a salad bowl with a piece of garlic or shallot. Then line it with young lettuce leaves that have been sprinkled with oil and vinegar.

Fill the centre with sliced tomatoes. Mix a good sprinkling of salt and pepper with two tablespoonsful of best salad oil. Stir in by degrees a dessertspoonful of brown vinegar and a teaspoonful of tarragon vinegar. Pour this on the tomato slices, sprinkle a little finely shredded shallot over, and serve.

TREACLE PUDDING. — 4 oz. breadcrumbs, 4 oz. suet, 4 oz. flour, 2 oz. sugar, 2 oz. currants, 2 eggs, 2 tablespoonsful treacle, 1 teaspoonful baking powder, grated rind and strained juice of 1 lemon, a little milk, pinch of salt.

Mix together the breadcrumbs, flour, suet, sugar, currants, baking powder and salt. Warm the treacle and to it add the well-beaten eggs, the lemon rind and juice. Stir this liquid into the dry ingredients and mix well. If necessary, add a little milk. Pour this mixture into a greased basin and steam for 2 hours.

TURBOT.—This fish is excellent fried in flakes. Flake the fish and press the flakes lightly in a cloth to dry them. Flour them, then dip in egg and breadcrumbs as you would whitebait. Drain on a sieve and serve with thin brown bread and butter and cut lemon. *(See also* HALIBUT.)

TURKEY.—Prepare and cook in the same way as fowl. *(See* FOWL.)

VEAL BRAISED WITH SAUSAGE MEAT.—2 to 3 lb. loin of veal, ½ lb. sausage meat, 1 oz. dripping, 2 tomatoes, 1 carrot, sprig of parsley, pinch of grated lemon rind, salt and pepper.

Ask the butcher to bone the meat. Chop the parsley finely and mix it and the lemon rind with the sausage meat.

Wipe the meat with a damp cloth, place it skin downwards on a board and spread the sausage meat on it. Roll up and tie securely with thin twine or thread. Make the dripping hot in a stewpan, put in the meat, and cook until nicely browned. Then lift out the meat, add the vegetables and cook 5 minutes, put in the bones from the meat and place the meat on top and sprinkle all with salt and pepper. Pour in half a pint of hot water, or stock if you have it, cover closely, and cook over gentle heat until the meat is tender. It will need about 2 hours' simmering.

Place the meat on a hot dish with the vegetables round. Keep hot while you skim off any fat from the gravy, add the tomatoes cut in slices, bring to the boil, rub through a sieve, and serve in a tureen.

VEAL, CURRIED.—About ¾ lb. cooked veal, ¼ pint stock made from veal bones, 1 level dessertspoonful curry powder, 1 dessertspoonful chutney, stick of rhubarb, 1 tomato, 1 onion, 1 large cooking apple, 1 oz. dripping.

Gas Regulo Mark 3, Electricity 350° F.

Peel and core the apple, peel and chop the onion, cut the rhubarb into small pieces. Melt the dripping in a pan, put in the onion and the meat cut into pieces, and fry gently until browned. Take out the meat and put it into a stewing pan or casserole.

Put the rhubarb, apple, tomato and onion into the first pan and cook all together until quite soft. Sprinkle in the curry powder. Stir over gentle heat for a few minutes. Add the stock gradually and bring to the boil. Rub all through a sieve. Pour this sauce on to the meat, add the chutney and cook in a very moderate oven for half an hour. Serve in a border of boiled rice.

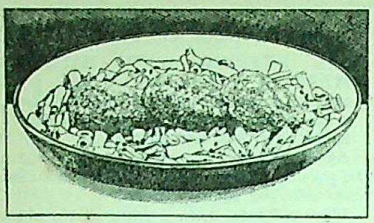
VEAL CUTLETS WITH MACARONI.—1 lb. veal cutlets, pinch of grated nutmeg, seasoning of pepper and salt, 1 gill tomato sauce, breadcrumbs, 1 egg, ¼ lb. macaroni, fat for frying, flour, 1 gill stock.

Put the macaroni into boiling water with a little salt and boil till tender; drain it thoroughly and keep it hot.

Trim the veal and cut it into neat cutlets about half an inch thick. Beat them

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Veal cutlets with macaroni is a delicious dish and takes very little time to prepare

with a rolling pin to make them tender. Dust them with flour, sprinkle with pepper, salt and nutmeg, then dip in beaten egg, cover with fine breadcrumbs, and fry in hot, smoking fat for 15 minutes, lessening the heat as soon as they are brown.

Drain all the fat from the frying pan, put in a gill of seasoned stock and the tomato sauce, and stir until it boils. Arrange the cutlets on a hot dish with the macaroni round and pour the gravy over it.

VEGETABLE MARROW, STUFFED.—1 small marrow, ¼ lb. minced cooked meat, 3 tablespoonsful breadcrumbs, 1 dessertspoonful chopped parsley, grated rind of ½ a lemon, salt and pepper, 1 egg or a little milk.

Gas Regulo Mark 5, Electricity 400° F.

Wash and peel a small marrow, keeping it whole. Then cut a wedge out of it lengthwise, and carefully scoop out all the seeds and soft pulpy part with a teaspoon. Now prepare a stuffing as follows. Into a basin put the meat, breadcrumbs, chopped parsley, a seasoning of salt and pepper to taste, and the grated rind of half a lemon. Mix these well and bind together with a well-beaten egg or a little milk. Put the stuffing into the marrow, replace the wedge and wrap the vegetable in well-greased paper, and tie with a piece of tape. Place the marrow on a well-greased baking tin. Bake in a moderate oven until tender. Remove the paper, put the marrow on a hot dish, and serve with gravy or tomato sauce.

VEGETABLES, TO DRY.—You will find dried root vegetables most useful for soups and stews when vegetables are scarce.

Clean and prepare them, then cut them into thin strips, spread them out on trays, and dry in an oven that is just warm, or in the sun, until they are quite hard. Mushrooms, too, are very successful when dried; large ones should be sliced, but tiny ones may be dried whole. Tried as a new experiment, they were found invaluable in meat pies, puddings and other made dishes, being soaked all night before use, and the water used for gravy. Peas are another vegetable which dries easily. See that they are perfectly free from maggots and dry them until they are hard.

VEGETABLES, TO PRESERVE IN SALT.—French and runner beans are best preserved in salt. Wipe them with a clean cloth, then slice them. Line jars with a thin layer of ordinary cooking salt, then put in a layer of beans; repeat the layers until the jars are full. Fill up the jars with more beans and salt each day as they shrink down. Cover with paper on lids to keep out the dust.

Beetroot and carrots may also be stored in layers of sand or cinder ash in any frostproof place.

Onions should be roped and hung in a cool, frostproof cellar.

WHITE SAUCE.—1 oz. flour, ½ pint milk, ½ saltspoonful salt, 1 oz. butter or margarine.

Melt the butter in a small saucepan. Stir the flour gradually into it, keeping it free from lumps. Stir while it cooks gently for 3 minutes, when it should be a smooth paste. Take the pan off the fire and add the milk very gradually, mixing well all the time until it is perfectly smooth. Add the salt. Then continue stirring over gentle heat until the sauce has boiled for 5 minutes. If through careless mixing it is at all lumpy, rub it through a sieve and re-heat.

This sauce is served with cauliflower, artichokes, etc., or used as a foundation for other sauces.

YORKSHIRE PUDDING.—3 oz. flour, ½ pint milk, a good pinch of salt, 1 egg, about 2 oz. dripping.

Gas Regulo Mark 5, Electricity 400° F.

Mix the salt with the flour and sift them. Separate the white from the yolk of the egg. Make a well in the centre of the flour and drop in the yolk. Mix a little of the flour with it. Then, very gradually, add half the milk, mixing in the remainder of the dry flour at the same time, until the mixture is perfectly smooth. Beat well until it is frothy and full of bubbles. Add the remainder of the milk and stir to mix. Leave for an hour. Then beat the white of the egg to a rather stiff froth and stir in lightly just before baking. This method makes a light, fluffy pudding.

If a more substantial one is preferred, drop the egg in whole before adding the milk. When ready to bake, heat the dripping in a baking tin, pour in the batter and bake in a hot oven for about half an hour.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Complete Instructions on the Making and Care of Gardens and Allotments, and the Cultivation of Flowers, Fruit and Vegetables, etc.

ABELE.—*See* POPLAR.

ABELIA (Caprifoliaceæ). — Evergreen and deciduous flowering shrubs mostly used on walls and trellises. Most are hardy, but some of the species are best grown in the greenhouse. *Soil:* Equal parts loam, peat and sand. Prune lightly after flowering. Stand outside during the summer. *Increase:* By layers in March, or by cuttings in July.

BEST TO GROW.—*A. floribundæ*, sub-evergreen, flowers crimson lake, 1½-2 in. long, tender. *A. grandiflora*, a hybrid of *A. chinensis*, evergreen, pink flowers from July to October. *A. triflora*, Jasmine-like flowers, which are creamy pink and scented, up to 12 ft.

ABIES (FIRS).—*See* CONIFERS.

ABUTILON (Malvaceæ).—Chiefly greenhouse plants, though one or two may be grown outside in sheltered gardens. *Soil:* Ordinary. Prune the youngest shoots annually. *Increase:* By cuttings or alternatively by seeds.

BEST TO GROW.—*A. vitifolium*, 15 ft. high, mallow-like flowers of pale mauve. Also a white variety of the same.

ACACIA (Leguminosæ). — Evergreen flowering shrubs or small trees mostly from Australia, and chiefly suitable for the cool greenhouse. *Soil:* Turfy loam, leaf mould and coarse sand with charcoal added. Should be pruned after flowering. *Increase:* By cuttings of half-ripened shoots in sandy peat; June.

BEST TO GROW.—*A. Baileyana*, hardy in warm districts. *A. dealbata*, the mimosa sold in the markets.

ACAENA (Rosaceæ).—Evergreen, trailing hardy perennials, suitable for the rockery. *Soil:* Moist, sandy loam. Plant from October to April. *Increase:* By seeds in March, cuttings in August, root division in April.

BEST TO GROW.—*A. Buchananii*, valuable for carpeting, bluish-grey leaves, 1-2 in. *A. Novæ Zealandiæ*, trailing bronze foliage and purple burrs, 9 in.

ACANTHOLIMON, Prickly Thrift (Plumbaginaceæ).—Dwarf hardy evergreen perennials for a sunny corner of the rockery. Useless for smoky districts. *Soil:* Sandy loam. Plant in spring. *Increase:* By seeds in March, cuttings in August, or by division.

BEST TO GROW.—*A. glumaceum*, rosy flowers in summer, 6 in.

ACANTHUS, Bear's Breech (Acanthaceæ).—Herbaceous plants valued for their foliage. Plant in beds, borders or cool greenhouse from October to April. *Soil:* Light. *Increase:* By seed or root division.

BEST TO GROW.—*A. mollis*, the plant whose leaves inspired the Corinthian style of architecture.

ACER.—*See* MAPLE.

ACERAS.—*See* ORCHIDS.

ACHILLEA (Compositæ).—Hardy herbaceous perennials for borders and rockeries. *Soil:* Ordinary. Plant from October to April. Lift seldom. *Increase:* By root division in autumn, or by seeds in spring.

BEST TO GROW.—*A. millefolium roseum*, 2-3 ft., rose. *A. ptarmica flore pleno*, the Pearl Flower; specially good varieties are "Boule de Neige," "The Pearl" and "Perry's White"; 2 ft. *A. rupestris*, a prostrate species with pure white flowers, 4 in.

ACHIMENES (Gesneraceæ). — Greenhouse tuberous rooted perennials, chiefly useful for hanging baskets and pots. *Soil:* One part fibrous loam, one part leaf mould, half part sand. Plant four in a 4½-in. pot 2 in. deep. *Increase:* By division of tubers.

BEST TO GROW.—The pink shades are most decorative, and some of the finest modern hybrids are: "Brightness," bright salmon-rose, dark foliage; "Delicacy," coral red; "Jewel," pale carmine; "Pink Pearl"; "Old Ivory"; "Lilac Queen."

ACINETA.—*See* ORCHIDS.

ACMENA (Myrtaceæ). — Greenhouse evergreen shrubs, for the cool greenhouse. *Soil:* Equal parts peat, loam and sand. Pot in March. *Increase:* By cuttings.

BEST TO GROW.—*A. floribunda*, white flowers, May to September, purple berries.

ACONITE, WINTER, *Eranthis* (Ranunculaceæ).—Hardy tuberous perennial, best naturalized in the wild garden or shrubbery. *Soil:* Ordinary. Plant in autumn 3 in. apart.

BEST TO GROW.—*Eranthis hyemalis*, yellow flowers in January, 3 in.

ACONITUM.—*See* MONKSHOOD.

ACORUS (Aroideæ).—Hardy perennial, suitable for marsh or water garden. Plant

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in sunny, marshy spots or in shallow water. *Increase:* By division in March.

BEST TO GROW.—*A. calamus*, Sweet Flag, has rush-like foliage. *A. graminеus* and its variegated form are useful in the water of Japanese gardens.

ACROSTICHUM.—*See* FERNS.

ACTINIDIA (Ternstrœmiaceæ).—Hardy deciduous climbing shrubs with edible, fleshy berries. Suitable for walls, pergolas, pillars and tree stumps. Valuable for their autumn colouring. *Soil:* Good loam. Prune in February by thinning and shortening the branches. *Increase:* By seeds, layers or cuttings.

BEST TO GROW.—*A. arguta*, one of the hardiest, white flowers, slightly fragrant. *A. Henryi*, partially evergreen, flowers rose-pink, needs wall protection.

ACTINOMERIS (Compositæ).—Herbaceous hardy perennial which can be grown in the border, shrubbery or wild garden. *Soil:* Ordinary. Plant in winter. *Increase:* By seed sown in spring.

BEST TO GROW.—*A. squarrosa*, flowers in July, bright yellow, 3 ft.

ADENOCARPUS (Leguminosæ). — Deciduous flowering shrub. *Soil:* Sandy loam. No pruning necessary. *Increase:* By seed sown in March, or by cuttings taken in spring or summer. These shrubs are not very long-lived, and a stock of seedlings should always be kept.

ADIANTUM.—Greenhouse and hardy ferns. (*See* FERNS.)

ADONIS (Ranunculaceæ). — Hardy annuals and perennials, mostly summer flowering. The annuals can be grown in the mixed border and the perennials on the rockery. *Soil:* Moist and sandy. *Increase:* By seeds sown in autumn or spring where the plants are to flower.

BEST TO GROW.—*A. æstivalis*, Pheasant's Eye, crimson, June. *A. aleppica*, a scarlet-flowered annual which is the best of the species. The flowers are tulip-shaped, 3 in. across, and very decorative.

ÆGLE (Rutaceæ).—The Hardy Orange, or Bengal Quince, a shrub which should be grown in every garden. *Soil:* Well-drained, fibrous loam and leaf mould in a warm position.

No regular pruning needed. *Increase:* By seeds sown in a frame in spring or by cuttings of half-ripened shoots.

BEST TO GROW.—*Æ. sepiaria*, fragrant, white flowers in April or May followed by small, orange-like fruits.

ÆSCHYNANTHUS (Gesneraceæ). — Stove plants useful to grow in hanging baskets like those used for orchids. *Soil:* Loam, leaf mould and sand, with some charcoal and a little chopped sphagnum. *Increase:* By cuttings.

BEST TO GROW.—*Æ. grandiflorus*, large scarlet flowers, August. *Æ. speciosus*, flowers rich orange, July.

AFRICAN LILY, *Agapanthus* (Liliaceæ).—Greenhouse herbaceous plant, but often grown in tubs in conservatories and loggias, and on balconies. The plants are not quite hardy, but with slight protection can be left in tubs outdoors all winter. *Soil:* Two parts loam, one part leaf mould, half part sand. Grow in full sunshine. Feed with liquid manure during growth. *Increase:* By division in spring.

BEST TO GROW.—*A. umbellatus*, the blue African Lily, and its white variety, *A. albus*. *A. Mooreanus* is a hardy species which has narrow leaves and flowers in late summer.

AGAPANTHUS.—*See* AFRICAN LILY.

AGATHÆA (Compositæ). — A greenhouse herbaceous perennial known as Blue Marguerite. *Soil:* Four parts loam, two parts leaf mould, one part sand. May also be grown in a sunny position outdoors. *Increase:* By cuttings of young shoots in March.

AGATHIS.—A tender conifer, sometimes grown in mild districts. (*See* CONIFERS.)

AGAVE (Amaryllidaceæ). — Greenhouse ornamental foliage and flowering plants, often called American Aloe. *Soil:* Four parts loam, two parts leaf mould, one part sand. Winter temperature, 45°. *Increase:* By offsets.

BEST TO GROW.—*A. americana variegata*, dark green and yellow leaves. There are several other species equally ornamental. The plants are a long time before they flower and are popularly, but perhaps erroneously, supposed to flower only once in a hundred years.

AGERATUM (Compositæ).—Hardy and half-hardy annuals. *Soil:* Ordinary. Sow under glass and plant 6 to 8 in. apart in a sunny position in June. *Increase:* By seed and also by cuttings of young shoots from plants kept in pots for stock.

BEST TO GROW.—Modern varieties of the species *A. mexicanum*, such as "Imperial Dwarf Blue," "Imperial Dwarf White," "Blue Ball," "Covent Garden" and "Swanley Blue."

AGROSTEMMA (Caryophyllaceæ). — Hardy perennials allied to Lychnis. *Soil:* Ordinary. Position, sunny. *Increase:* By seed.

BEST TO GROW.—*A. coronaria*, the Rose Campion and its white variety.

AGROSTIS (ANNUAL GRASSES). — *See* GRASSES.

AILANTHUS, The Tree of Heaven (Simarubaceæ).—A very decorative Chinese tree with long, palm-like leaves that turn a rich yellow in autumn. *Soil:* Ordinary. Position, sunny and open. Plant in November. *Increase:* By means of root suckers placed in a frame during August.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BEST TO GROW.—*A. altissima* and its variety *pendulifolia*, which has drooping leaves.

AJUGA (Labiatæ).—Mostly plants that make spreading mats of foliage above which rise 4-in. spikes of dark blue flowers in summer. *Soil:* Ordinary, but prefer a damp spot in cool sun. *Increase:* By cuttings.

BEST TO GROW.—*A. reptans atropurpurea*, dark purplish foliage. *A.* "Rainbow," variegated foliage, assuming shades of bronze, cream, purple and crimson.

AKEBIA (Berberidaceæ).—Vigorous partially evergreen climbers. *Soil:* Good loam against shady walls or trellis. *Increase:* By layers, cuttings or division.

BEST TO GROW.—*A. lobata*, the flowers appear in April and as they are often damaged by frosts the conspicuous and highly coloured fruits are seldom seen. *A. quinata*, pale purple flowers of spicy fragrance.

ALANGIUM.—A stove evergreen of no garden value.

ALBIZZIA (Leguminosæ). — Small Acacia-like tree, not very hardy. *Soil:* Warm, light. Against a wall. *Increase:* By seeds.

BEST TO GROW.—*A. odoratissima*, flowers pale yellow, 4-5 ft. in warm localities.

ALBUCA (Liliaceæ).—Greenhouse bulbs that may be planted outdoors in the same way as Belladonna Lilies. *Soil:* Light, sandy loam with leaf mould. Winter protection. *Increase:* By seeds, suckers, or leaves taken off with a scale.

BEST TO GROW.—*A. abyssinica*, 2 ft., white. *A. aurea*, greenish yellow, 2 ft. *A. fibrosa fragrans*, scented, greenish-yellow, 2 ft.

ALCHEMILLA (Rosaceæ).—Hardy and half-hardy plants suitable for the rock garden or greenhouse. *Soil:* Ordinary, well drained. *Increase:* By seeds or root division.

BEST TO GROW.—*A. alpina*, the Alpine Lady's Mantle. Light green, kidney-shaped leaves, silvery underneath, with the power of condensing moisture from the air. Flowers yellow-green; very decorative in the mass.

ALDER, *Alnus* (Betulaceæ).—Deciduous flowering trees and shrubs allied to the birches. *Soil:* Deep loam or rather wet situations. *Increase:* By seed or cuttings.

BEST TO GROW.—*A. cordata*, a handsome alder which grows up to 70 ft. and will thrive on dryish soil in chalky districts as well as near water. *A. firma*, the Japanese alder, distinct and graceful, 30 ft. *A. glutinosa*, common alder, a useful timber tree, up to 90 ft. *A maritima*, seaside alder, 30 ft. *A. sitchensis*, the Sitka alder. 40 ft., catkins up to 5 in. long.

ALISMA, Water Plantain (Alismaceæ). —*See* WATER PLANTS.

ALLIUM (Liliaceæ). — Hardy bulbs with ornamental flowers. The genus also includes chives, leeks, onions and shallots. *Soil:* For ornamental alliums, light sandy. Position, sunny borders, rock garden. Plant in October or November, generally 3 in. deep and 4 in. apart. *Increase:* By seeds.

BEST TO GROW.—*A. coeruleum* or *azureum*, blue, June. *A. neapolitanum*, whitish-green. *A. Moly*, bright yellow.

ALLOTMENTS.—In rural districts, and other districts where land is available, an allotment can be obtained by any local resident on demand, through the local authorities. The Allotments Act of 1922 is regarded as the Allotment Holders' Charter. It compels local councils to establish local allotment committees where necessary, in every borough or urban district with a population of 10,000 and upwards, unless exempted by the Ministry of Agriculture after consultation with the Ministry of Health.

It provides for compensation to be paid to allotment holders in certain cases on the termination of their tenancies. It provides for a six months' or longer notice to quit in the case of land let by private landlords, except under certain conditions.

Copies of the Allotments Act can be purchased from H.M. Stationery Office, Kingsway, W.C.2. (For cultivation of allotments *see* VEGETABLE GARDEN.)

ALLOTMENT SOCIETY, THE NATIONAL.—The headquarters of the allotment movement in England and Wales. *Objects:* The circulation of all matters appertaining to the allotment movement, and the securing of improved legislation and better conditions for allotment holders. A monthly bulletin is issued free to all members. The National Allotment Society's journal is published quarterly at two-and-sixpence per dozen. *Subscriptions:* Individual members, five shillings per annum minimum, in addition to taking up one two-and-sixpenny share on admission. Associations, one two-and-sixpenny fully paid-up share when joining, and affiliation fees based on threepence per member. Local authorities, a two-and-sixpenny share and a contribution of £2 2s. per annum. *Address:* Drayton House, Gordon Street, W.C.1.

ALMOND (*Prunus Amygdalus*). — A decorative tree usually grown for the beauty of its flowers, and particularly because it flowers early in the year. The fruits do not always ripen in England. *Soil:* Warm, well-drained loam. Plant between October and March. *Increase:* By seed if liked, but the plants are seldom very hardy and it is better to bud on to plum stock.

ALNUS.—*See* ALDER.

ALOCASIA (Aroideæ).—Stove perennials

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

valued for the variegated foliage. *Soil:* Well drained sandy loam, charcoal and a little peat. The moist atmosphere of the stove is best for these plants and if they are used as room plants they should not be kept for long periods in dark corners. *Increase:* By seeds or by division of the rhizomes.

ALOE (Liliaceæ).—This is the medicinal aloe which is a greenhouse succulent with ornamental foliage, the leaves being more or less prickly. *Soil:* Two parts loam, one part peat, old mortar and river sand. Pot in March, and grow in a sunny greenhouse. Minimum temperature, 50°. *Increase:* By seeds. (For American Aloe: *See* AGAVE.)

ALONSOA (Scrophulariaceæ).—Half-hardy shrubby perennials. *Soil:* Two parts loam, one part leaf mould and sand. Warm sunny beds outdoors or pots near the greenhouse windows. *Increase:* By seeds sown in March for bedding out in May, or for growing in pots. Also by cuttings in pots of sandy soil in August.

BEST TO GROW.—*A. Warscewiczii*, the popular rosy-scarlet flower used as a dwarf bedding plant with taller flowers.

ALPINES.—Name given to plants whose native home is in the high Alps. The majority of these are grown in Britain in the rock garden, when light, open soil and a cool root-run can be provided. *See* ROCK PLANTS.

ALPINIA, Indian Shell Flower (Scitaminaceæ). — Stove herbaceous perennials. Suitable for large pots, tubs or bed. *Soil:* Equal parts loam, leaf mould and peat. Plant in March. Minimum temperature, 55°. *Increase:* By division in March.

ALSTROEMERIA, Peruvian Lily (Amaryllidaceæ).—Tuberous rooted summer flowering plants for sheltered positions. *Soil:* Sandy and well drained. *Increase:* By division in autumn. Also by seeds sown in autumn or spring in the warm greenhouse.

BEST TO GROW.—*A. aurantiaca*, orange with red streaks. *A. peruviana*, yellow tipped with green, and spotted maroon.

ALTHAEA.—*See* HOLLYHOCK.

ALYSSUM (Cruciferæ).—Dwarf annuals or perennials, flowering May to June, and in the case of annuals all through the summer. Suitable for sunny beds, edgings and rock gardens. *Soil:* Preferably sandy. *Increase:* By seeds or cuttings and sometimes by division.

BEST TO GROW.—*A. saxatile*, the Gold Dust Alyssum, a favourite for rock gardens, generally increased by seed, but perennial. *A. saxatile citrinum*, the same but sulphur-yellow. *A. maritimum*, white, fragrant.

AMARANTHUS, Love Lies Bleeding (Amarantaceæ). — Half-hardy annuals, growing from 2 to 3 ft. high, with flowers on tail-like inflorescences that rise from the axils of the leaves. They are commonly used for bedding plants to be set out in June, or for pot plants in the greenhouses. *Soil:* Ordinary. Position, sunny. *Increase:* By seeds under glass in March.

BEST TO GROW.—*A. caudatus*, Love Lies Bleeding, crimson-purple. *A. hypochondriacus*, Prince's Feather.

AMARYLLIS, Belladonna Lily (Amaryllidaceæ).—A hardy summer-flowering bulbous plant. *Soil:* Loam, leaf mould and sand. Position at foot of south wall in light, fairly rich soil, and they should be protected with litter during the winter. *Increase:* By offsets.

BEST TO GROW.—*A. Belladonna*; varieties "Blanda" and "Pallida," both pinkish.

AMELANCHIER, The Snowy Mespilus (Rosaceæ). — Ornamental and deciduous flowering small trees or shrubs. *Soil:* Good loam. Prune when necessary after flowering. *Increase:* By layers in spring, cuttings in October, or seeds sown in March.

BEST TO GROW.—*A. alnifolia*, "June Berry," flowers in May, followed by berries resembling black currants, 10-20 ft. *A. canadensis*, "Service Berry."

AMERICAN BLIGHT.—A white cottony substance on trees and roots. Brush affected areas with methylated spirit.

AMMOBIUM (Compositæ).—Half-hardy annuals. An interesting everlasting-flowered plant related to the Swiss Edelweiss. *Soil:* Ordinary, light. Warm, sunny position. *Increase:* By seeds sown in autumn in a cool greenhouse, or sown in spring and planted out in flowering quarters in April.

AMORPHA (Leguminosæ).—Deciduous shrubs with pea-shaped flowers from June to September. *Soil:* Dry, sandy. *Increase:* By seeds, layers in summer, cuttings in autumn, suckers in winter.

BEST TO GROW.—*A. canescens*, "Lead Plant," purple-blue, 2-4 ft., suitable for sunny border. *A. fruticosa*, "False Indigo."

AMPELOPSIS.—*See* VITIS.

AMPHICOME (Bignoniaceæ). — Half-hardy perennial herbs with trumpet-shaped flowers. *Soil:* Sandy. *Increase:* By seeds or cuttings.

AMYGDALUS.—*See* ALMOND.

ANACAMPSEROS (Portulaceæ).—Succulent herbs, rather tender, except for the species *A. borderi*. *Soil:* Ordinary, sandy. *Increase:* By cuttings.

ANACARDIUM (Anacardiaceæ).—Stove evergreen trees. *Soil:* Loam and peat with some sand. *Increase:* By seeds or cuttings.

BEST TO GROW.—*A. occidentale*, the Cashew Nut. The kernels of the pear-shaped fruit are roasted and eaten.

ANAGALLIS, Pimpernel (Primulaceæ). Annuals and perennials that are best

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

treated as annuals. Suitable for the rock garden. *Soil:* Ordinary. *Increase:* By seeds.

BEST TO GROW.—*A. grandiflora*, a half-hardy annual, 4 in. high, with quantities of flowers in varying shades of blue produced from May to September. *A. linifolia cærulea*, 9-12 in., flowers of an intense gentian-blue, fully 1 in. across. *A. Parksii* and *A. Phillipsii* are forms of *linifolia* which possess flowers of red and blue shades.

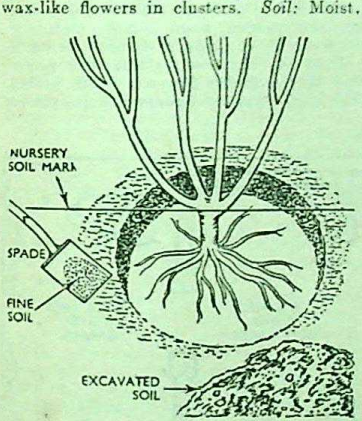
ANAPHALIS (Compositæ). — Everlasting flowers. *Soil:* Ordinary, may be planted in the rock garden or border. *Increase:* By division.

BEST TO GROW.—*A. margaritacea*, the pearly everlasting flower, snow-white, woolly leaves and heads of whitish flowers, 2½ ft., July onwards.

ANCHUSA (Boraginaceæ). — Annuals and perennials, suitable for beds, borders and rockeries. *Soil:* Ordinary. Position, sunny. *Increase:* By seed, or by root cuttings in the case of perennials.

BEST TO GROW.—*A. italica*, varieties "Dropmore" (deep gentian-blue) and "Opal" (Cambridge blue).

ANDROMEDA (Ericaceæ).—Dwarf evergreen shrub, with pink, pitcher-shaped, wax-like flowers in clusters. *Soil:* Moist,



All types of shrub—including roses—must be planted very carefully, as they will have to remain in position for several years

peaty. Partial shade and shelter from cold winds desirable. *Increase:* By layers or cuttings.

ANDROSACE, Rock Jasmine (Primulaceæ).—Rock plants, some of which are very exacting and usually grown in the alpine house, while others will grow in any ordinary rockery. *Soil:* Well-drained and gritty. *Increase:* By seed, but preferably by divisions and cuttings.

BEST TO GROW.—*A. carnea*, emerald green mats studded with loose heads of pink flowers. This succeeds best in a mixture of peat and gritty loam. 2 in. *A. chamæjasme*, small heads with large, pearl-white flowers that turn to blush-pink before fading. Suitable for the moraine, or in a similar compost to *A. carnea*. *A. lactea*, milk-white flowers with a golden eye. Easily propagated by runners.

ANEMONE, Windflower (Ranunculaceæ).—Hardy tuberous-rooted and herbaceous perennials. Height up to 2 ft. *Soil:* Deep and rich with plenty of manure well decayed so that it holds moisture. Full sun and partial shade will do. *Increase:* Tuberous-rooted anemones by seeds sown in prepared beds in January or July, or by offsets, removed annually after flowering.

BEST TO GROW.—Herbaceous varieties: *A. alpina*, 6 in., white. *A. Pulsatilla*, purple, spring, the Pasque Flower. *A. japonica*, September-flowering perennial, 2 ft., very useful for mixed borders; rose and white shades only are obtainable. Tuberous varieties: *A. coronaria*, the "Poppy Anemone," spring flowering, various colours. *A. fulgens*, the spring-flowering "Scarlet Windflower." The commercial and exhibition varieties of "St. Brigid," "Empress," "Aldeborough" and other anemones are mostly selections of these two. *A. blanda*, the blue winter-flowering anemone, should be grown in the winter garden.

ANGELICA (Umbelliferæ).—Perennial herb used for flavouring confectionery. *See* HERB GARDEN.

ANGIOPTERIS. — Stove Fern. *See* FERNS.

ANGRÆCUM.—Stove epiphytal orchids. *See* ORCHIDS.

ANIGOZANTHOS (Hæmodoraceæ). — Greenhouse herbaceous plants. *Soil:* Two parts of peat, one of loam with some sharp sand. *Increase:* By division, when repotting in spring.

ANNUAL.—A plant which is raised from seed, flowers and dies in one season. For exhibition purposes, annuals should be those plants "which in this country naturally and ordinarily begin and end their growth, ripen seed and die (irrespective of frost) within twelve months." This is the definition given by the Royal Horticultural Society.

ANŒCTOCHILUS. — Stove terrestrial orchids. *See* ORCHIDS.

ANTENNARIA (Compositæ). — Rock plants with white chaffy flowers and silvery leaves. *Soil:* Ordinary. *Increase:* By division of roots in March.

ANTHEMIS, Ox-eye Camomile (Com-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

positæ).—Hardy perennials suitable for borders and rockeries. *Soil:* Ordinary. *Increase:* By seeds or division of roots in spring.

BEST TO GROW.—*A. tinctoria*, yellow, 2½ ft. *A. Sancti-Johannis*, orange, 2 ft.

ANTHERICUM (Liliaceæ). — Hardy herbaceous perennials. *Soil:* Deep, rich, sandy. *Increase:* By division of roots, or by seed in September.

BEST TO GROW.—*A. liliago major*, a superior form of the St. Bernard's Lily, flowering in July and August, which will be found valuable for cultivation in the shaded border.

ANTHURIUM (Aroideæ).—Stove perennial with ornamental flowers and foliage. *Soil:* Equal parts loam, peat and sphagnum moss. Use well-drained pots and stand in a shady position. Repot in early spring. Winter temperature, 60°. *Increase:* By division in March, or by seeds sown in sand, peat and charcoal dust.

ANTIRRHINUM, Snapdragon (Scrophulariaceæ).—Strictly speaking, these are perennials, but are usually treated as annuals or biennials. They are mostly raised from seed sown in March, but where an increase of stock of any particular variety is wanted cuttings are often taken in August or September and inserted in sandy soil in a cold frame. The popular antirrhinums used in beds and borders are of *majus*, *maximum* or *nanum* types. For pot plants in the greenhouse it is usual to use the *nanum grandiflorum* varieties. Seeds should be sown in the cool fraime or greenhouse in July or August, and finally potted on into 32-size pots for flowering, using good fibrous loam with decayed manure, leaf mould and mortar rubble. Varieties recommended for greenhouse culture are: "Majestic," "Orange King," "Majestic Twilight," "Victory," "Melrose Pink," and "Empress."

For garden decoration antirrhinums should be sown in February or March under glass, and are best planted out in May.

ANTS.—*See* PESTS AND DISEASES.

APHIDES or APHIS.—*See* PESTS AND DISEASES.

APHYLLANTHES (Liliaceæ). — Half-hardy herbaceous perennial, with blue flowers on rush-like branches. *Soil:* Sandy loam and leaf mould. Position, warm and sunny. *Increase:* By division or seeds.

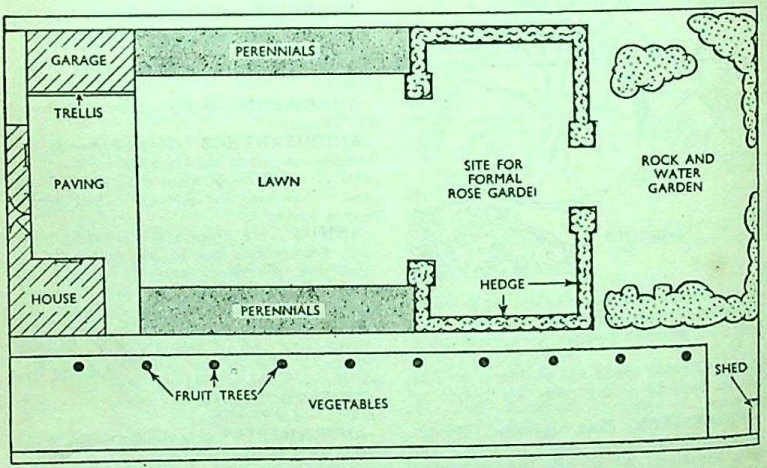
APONOGETON, Water Hawthorn (Naiadaceæ).—A rampant pond weed. (*See* WATER PLANTS.)

APPLE BLOSSOM WEEVIL.—A pest controlled only by traps. (*See* PESTS AND DISEASES.)

AQUILEGIA.—*See* COLUMBINE.

ARABIS (Cruciferæ).—The familiar wall or rock garden plant. *Soil:* Ordinary. *Increase:* By cuttings, or division, or seeds.

BEST TO GROW.—*A. albida flore pleno;* this is the double-flowered white arabis. The single variety flowers a little earlier



A plan of the site for even a small garden—which should be prepared before any digging is done—will ensure that a pleasing result is obtained on completion of the work

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but it is not so long-lasting, or so showy. A single form, with golden variegated leaves, is specially useful for the rock garden, as it does not spread so rapidly.

ARACHIS.—The plant which produces monkey nuts. These are the fruits which, after the flowers have died, are pushed downwards into the ground by the lengthening and bending of the fruit stalk.

ARAUJIA (Asclepiadeæ). — Twining evergreen shrubs or climbers. *Soil:* Loam and peat in equal parts with plenty of sand. Only suitable for mild districts, or for growing under glass. *Increase:* By seeds or cuttings.

ARBUTUS (Ericaceæ).—Evergreen trees and shrubs with attractive dark green foliage, coloured bark, white, pitcher-shaped flowers and ornamental fruit. *Soil:* Good loam with peat or leaf mould. *Increase:* By seed. The plants transplant badly, and should therefore be grown in pots until they are set in the open.

BEST TO GROW.—*A. unedo*, the Strawberry Tree that is a native of south-west Ireland.

ARCTOSTAPHYLOS (Ericaceæ). — Small trailing shrubs with glossy leaves, small flowers and red, inconspicuous berries. *Soil:* Sandy peat in the rock garden. *Increase:* By seed, previously soaked in water at boiling point for 20 seconds. Also by budding, inarching or division.

BEST TO GROW.—*A. alpina*, deciduous, suitable for damp, cool conditions. The foliage turns brilliant red in autumn.

ARCTOTIS (Compositæ). — Half-hardy perennials and annuals. All best treated as annual. *Soil:* Loam, leaf mould and sand, with a little charcoal for plants grown in pots. Ordinary light soil outdoors. *Increase:* By seeds or cuttings.

ARECA, The Betel Nut Palm (Palmæ).—*Soil:* Peat or leaf-soil and loam. *Increase:* By seeds sown in the moist stove.

BEST TO GROW.—*A. catechu*, the Betel Nut Palm, a stove palm with leaves 3-6 ft. long; the plants grow to a height of 30 ft. *A. lutescens*, a popular palm with long plume-like bright green leaves and yellow petioles on its numerous branches, 20 ft.

ARENARIA, "Sandworts" (Caryophyllaceæ).—Low-growing plants, they mostly form mats which creep over stones. *Soil:* Cool, light, and in a sunny or shady position. *Increase:* By seeds or division.

BEST TO GROW.—*A. balearica*, a particularly useful plant for the edges of stone walks in the rock garden. *A. cæspitosa aurea* (syn. *Sagina subulata*), a golden carpeting plant.

ARGEMONE, The Prickly Poppy (Papaveraceæ). — Hardy annuals. *Soil:* Ordinary. *Increase:* By seeds.

BEST TO GROW.—*A. mexicana*, with white poppy-like flowers and ornamental silvery foliage. *A. mexicana*, similar, but the flowers are yellow.

ARISTOLOCHIA (Aristolochiaceæ). — Hardy and half-hardy perennials. *Soils:* Ordinary good loam. *Increase:* By division, cuttings or seed.

ARISTOTELIA (Tiliaceæ).—Half-hardy evergreen shrubs. *Soil:* Ordinary garden. *Increase:* By layers or cuttings.

BEST TO GROW.—*A. macqui*, evergreen spreading shrub, flowers greenish-white, followed by purplish fruits the size of a pea; these can be made into wine. *A. m. variegata* is a handsome form, with yellow variegated leaves.

ARNICA (Compositæ).—Dwarf hardy herbaceous perennials. *Soil:* Peat, mixed with loam and sand. *Increase:* By seeds or division.

BEST TO GROW.—*A. montana*, a useful rock plant, the flowers and roots of which are used for treating bruises and swellings. *A. Chamissonis*, flowering from July to September, yellow.

ARSENATE OF LEAD.—*See* PESTS AND DISEASES.

ARTEMISIA (Compositæ).—Evergreen or deciduous shrubs. *Soil:* Well drained, not too rich. Position, sunny. *Increase:* By division in October, or cuttings in July.

BEST TO GROW.—*A. abrotanum*, the Southernwood, or Old Man, whose fragrant leaves are well known. *A. lactiflora*, Chinese species of exceptional merit, which has terminal spikes of creamy-white flowers.

ARTICHOKE, CHINESE, *Stachys tubifera* (Labiatæ).—This is a perennial tuberous-rooted plant, the spiral nobbly roots of which are edible. It is not very popular except in large establishments, but makes a useful addition to an exhibition group of vegetables, and is well-liked on the table. Plant the tubers in March or April in deeply dug, well-drained soil in a sunny position. Set them 4 in. deep and 9 in. apart, and allow 18 in. between each row. Give plenty of water in dry weather and keep down the weeds by hoeing.

ARTICHOKE, GLOBE, *Cynara Scolymus* (Compositæ).—The flowerheads, which form large fleshy scales or bracts, are the portion used in the kitchen. The plants are perennial and form large, imposing clumps, so that they can be used for decorative purposes if liked. Sow seeds in March in a temperature of 50-60° or plant offshoots from older plants. The soil should be deeply dug and rich, as the plants are gross feeders. April is planting time, and the plants are generally set in clumps of three, 18 in. apart, allowing 4½ ft. between each clump. Water liberally.

ARTICHOKE, JERUSALEM, *Helianthus tuberosus* (Compositæ).—A member

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the sunflower family, though it flowers rarely in Britain. On account of its rapid growth it is often used as a summer screen plant for odd corners. Any soil or position will do, though the best plants are obtained in an open soil in a light, sunny position. Dig deeply, and in February or March set the tubers 6 in. deep and 2 ft. apart.

ARUM LILY.—These do not belong to the genus *Arum*, of which the English Cuckoo Pint is a well-known representative. The Arum Lily belongs to the genus *Richardia* (Aroideæ), greenhouse herbaceous perennials. *Soil:* Two parts rich fibrous loam, one part each leaf mould and sharp sand. Repot annually in autumn. After flowering stand the plants outside until autumn again. Keep a look-out for green-fly, as this pest is often troublesome. *Increase:* By seeds, division of plants when repotting, or by suckers.

ASCLEPIAS (Asclepiadeæ). — Ornamental perennials, the hardy species of which can be grown in the herbaceous border. *Soil:* Light rich loam and leaf-soil. *Increase:* By seeds, division or cuttings.

BEST TO GROW.—*A. cornuti*, mauve fragrant flowers, height 4 ft., July. *A. incarnata*, red, June.

ASH.—*See* SHRUBS AND TREES.

ASIMINA (Anonaceæ). — Hardy deciduous shrub, seldom grown in Britain. *Soil:* Peat and sand. *Increase:* By seeds or layers.

BEST TO GROW.—*A. triloba* (Syn. *Anona triloba*), the Papau Tree.

ASPARAGUS (Liliaceæ).—The genus includes both the edible asparagus and the greenhouse ornamental kinds. Cultivation of edible asparagus should be more widespread than at present. Although a period of two or three years passes before the crop begins to mature, a bed once started will produce crops for a score or more years. Trench the soil thoroughly to a depth of 3 ft., adding cow or pig manure to light soils and burnt or coarse grit to clay. It is best to make the beds 4 ft. wide and any convenient length. Plant in April or early May, setting one row along the centre of the bed and two others 15 in. away, one on each side. Strong two-year-old crowns should be set 15 in. apart along these lines. The crowns will be 3 in. below the surface. Do not cut earlier than the second or third year after planting, and never cut later than June. Cut down the tops in autumn before the berries fall, and give a dressing of well-decayed manure. At the end of March use 3 oz. per square yard of a dressing made with 6 lb. common salt, 2 lb. sulphate of potash, 3 lb. nitrate of soda and 3 lb. superphosphate of lime. Soil for greenhouse asparagus: Loam, leaf mould and sharp sand. Plants can be raised from seed and potted on till they reach 32-size pots. They respond to feeding with diluted manure water.

ASPERULA, "Sweet Woodruff" (Rubiaceæ).—Hardy dwarf annuals and perennials of the same family as the coffee plant. Suitable for the rock garden. *Soil:* Light, rich. Preferably under the shade of trees or on the shady side of the rockery. *Increase:* By seeds or, in the case of perennials, by division.

ASPHODELINE (Liliaceæ). — Hardy herbaceous perennials, distinguished from Asphodelus by the erect leafy stems. *Soil:* Ordinary, in sun or partial shade. *Increase:* By division in spring or autumn.

ASPHODELUS, "The Asphodel" (Liliaceæ).—Tuberous-rooted hardy perennials. *Soil:* Rich sandy loam. *Increase:* By seeds or division.

ASPIDISTRA (Liliaceæ). — *See* ROOM PLANTS.

ASPIDIUM.—Greenhouse and Hardy Ferns. (*See* FERNS.)

ASTER, CHINA, *Callistephus* (Compositæ).—Half-hardy annual. *Soil:* Well dug, with a dressing of old, well-decayed manure and also 6 oz. per square yard of lime forked in during March. Lime prevents attacks of stem rot. Sow the seeds in March in a cold frame in light soil. Transplant as required, treating the seedlings tenderly, as damage to the tissues allows disease spores to enter. The plants should be grown on with as little check as possible, and are best planted out at the end of May.

The types may be grouped as follows:

Dwarf types (9-12 in.).—Chrysanthemum-flowered, "Lilliput," "Dwarf Bouquet."

Tall types (2¼-3 ft.).—Californian Giant comet-flowered and Californian Giant single-flowered. A wide range of colours is obtainable in each of the classes, and some of the new single asters are particularly useful for decorative work. The singles may be sown out-of-doors in April where they are to flower.

ASTRAGALUS (Leguminosæ).—Herbs or sub-shrubs, suitable for the rockery. *Soil:* Light. Situation, sunny. *Increase:* By seeds or cuttings.

ASTRANTIA (Umbelliferæ). — Hardy herbaceous perennials suitable for borders or for the wild garden. *Soil:* Ordinary, but preferably a shady position with cool, moist loam. *Increase:* By division in winter or spring.

ATAVISM. — Means reversion to an older type. (*Atavus*, an ancestor.)

ATHROTAXIS, Tasmanian Cedars.—For cultivation: *See* CONIFERS.

ATRIPLEX (Chenopodiaceæ). — Hardy

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

annual. *Soil:* Light, dry, in full sun. *Increase:* By seeds.

BEST TO GROW.—*A. hortensis cupreata*; the foliage of this is a rich coppery bronze and conspicuous in the mixed border. Flowers are insignificant.

AUBERGINE or EGG PLANT, *Solanum Melongena* (Solanaceæ). — A greenhouse plant. The fruits are edible, though they are more commonly grown in Britain for decoration. *Soil:* Two parts fibrous loam, one part each leaf mould and well-decayed manure with some sand. Sow seeds in a temperature of 75°, January to March.

BEST TO GROW. — "Long Purple," "Round Purple," "Egg-shaped White" and "Striped."

AUBRIETIA (Cruciferæ).—Hardy evergreen carpet plants for the rock garden or spring bedding or for edgings for the mixed border. *Soil:* Light, sandy or ordinary. *Increase:* By division, cuttings, or seeds.

BEST TO GROW.—Modern named hybrids are better than the old varieties and show a remarkable range of colours. The following are recommended: "Bridge Seedling," blue; "Crimson Gem"; "Doctor Mules," deep violet; "Gloriosa," pink; "J. S. Baker," violet blue, with white eye; and "Violet Queen."

AUCUBA (Cornaceæ). — Useful evergreens for hedges. (*See* SHRUBS AND TREES.)

AURICULA, *Primula Auricula.* — Numerous types are now grown, and various hybrids and a remarkable range of colours have been developed since the auricula first became a popular flower in the North of England.

Cultivation.—For Alpine auriculas and also for the show plants, soil should be fibrous loam with well-decayed manure, leaf mould and sand. New varieties are generally raised from seed collected from plants cross-fertilized carefully from others of the same type, that is to say, green edged with green edged, and so on.

Auricula seed is rather erratic in germination, and seedlings do not sometimes appear until two years after sowing. The seedlings are potted on gradually until they reach 5-in. pots, when they begin to flower. In winter, auriculas need no special care if kept in the cold greenhouse. Repotting should take place after flowering. Keep a sharp watch for aphis, which is often troublesome.

AZALEA.—The genus Azalea is now included with the rhododendron, but the amateur gardener recognizes a difference between the two. Azaleas are for the most part dwarf, slow-growing shrubs with masses of gorgeously coloured flowers. The genus is extraordinarily large, but the azaleas chiefly grown by amateurs are the florists' azaleas of named varieties. These thrive in the same soil as rhododendrons, and can be grown with the rhododendrons, so that the evergreen rhododendrons form a background for the bright flowers and autumn foliage of the azaleas. If azaleas are purchased in pots, already in bloom, they are probably forced shrubs. Treatment after the flowers have faded should consist in planting out the azalea in a sheltered position in the garden, where the soil is lime-free. If preferred the pot can be set below the soil level. It should remain outdoors all summer and can be brought into a greenhouse again for the winter.

AZARA (Bixaceæ). — Hardy or half-hardy flowering shrubs with fragrant flowers. *Soil:* Well-drained loam and leaf mould. *Increase:* By cuttings.

BEST TO GROW.—*A. microphylla*, an elegant shrub or small tree, sometimes reaching to 30 ft. Sweetly scented flowers, open in February and March in favourable weather.

B

BABIANA (Iridaceæ).—Half-hardy bulbous plants with fragrant flowers. *Soil:* Light, sandy, in a well-drained border. Plant from September to January, 4 in. deep and 2 in. apart. When the plants have flowered and the foliage died down, lift and store until planting time. These bulbs can also be grown in pots of sandy soil and leaf mould, treating them in the same way as ordinary spring-flowering bulbs. For pot culture they can be planted either in autumn or spring. *Increase:* By offsets.

BACTRIS (Palmaceæ). — The Tobago Cane or Maharajah Palm. Stove palms valued for their ornamental foliage. *Soil:* Equal parts loam, leaf mould and sand. Minimum temperature, 60°. *Increase:* By young plants which grow from the base of the old ones. Walking sticks are made from this palm.

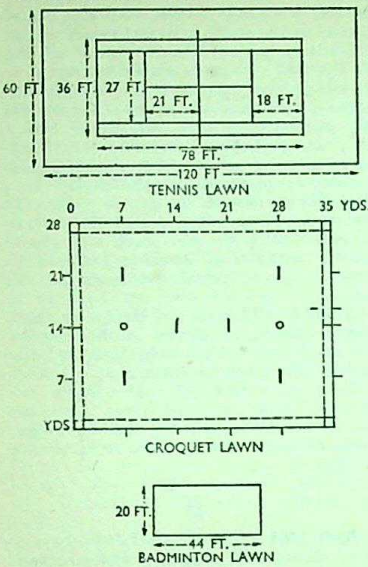
BADMINTON COURT.—The size of a double court is 44 ft. by 20 ft., and a single court 44 ft. by 17 ft.

BALSAM, *Impatiens balsamina* (Geraniaceæ). — Half-hardy annuals, valuable because they will grow in the shady border. *Soil:* Fibrous loam, leaf-mould and sand to which rotten manure has been added. This is used for the plants when they are grown in pots, but any ordinary good garden soil will do for outdoor culture. Sow in spring in pans over slight bottom heat, for potting on or planting out as required.

BAMBOO, *Arundinaria, Bambusa*, etc. (Gramineæ). — Quick-growing evergreen shrubby grasses, ranging from dwarf

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Games lawns—even in the garden—should be of the standard size wherever possible

species, 18 in. high, to species that tower to a height of 100 ft. All spread by means of rhizomes running under the surface soil in the manner of couch grass. Bamboos are useful for planting woodland walks in shrubberies, and particularly for planting the sides of ponds and streams, as they appreciate a moist soil. *Increase:* By seeds when obtainable, by division of plants, or by layering, that is by pegging down the shoots into the soil. May is the best month for layering.

BANKSIA (Proteaceæ). — Evergreen shrubs that are only half-hardy and need a warm position. *Soil:* Loam, leaf mould and sand. *Increase:* By cuttings, cut at a joint but with none of the leaves removed.

BAPTISIA (Leguminosæ).—Hardy herbaceous perennials. *Soil:* Ordinary in a sunny border. Plant from October to April. *Increase:* By seeds or division.

BARBERRY.—*See* BERBERIS.

BARLERIA (Acanthaceæ).—Evergreen stove flowering shrubs. *Soil:* Two parts peat and loam, one part decayed manure and sand. Minimum temperature, 55°. Pot in March. Prune back all shoots after flowering. *Increase:* By cuttings inserted in sandy peat at a temperature of 85°.

BARTONIA (Loasaceæ). — The hardy annual *Bartonia aurea* is the best to grow of this genus. *Soil:* Deep and fairly rich. Sow in March where it is to flower and thin 1 ft. apart. The plants attain a height of 18 in. and flower all through the season, producing spreading blooms—as much as 2 in. across—of a rich golden yellow.

BASIL.—*See* HERBS.

BASS or BAST.—Dried vegetable fibre used for tying plants.

BAY, *Laurus nobilis* (Laurineæ).—A hardy evergreen tree with ornamental foliage, the leaves of which are aromatic and are used for flavouring purposes. *Soil:* Ordinary, in a sunny, sheltered position. Pruned in April, to keep the plants shapely. *Increase:* By cuttings or layers.

BEAN APHIS.—Spray with hellebore or derris.

BEANS, "BROAD" *Vicia Faba* (Leguminosæ).—An annual plant believed to have originated in North Africa. Sow early in the year in January or February, according to location and weather conditions. Beans can also be sown in October or November in sheltered gardens. *Soil:* Ordinary, well dug and well manured, afterwards dressed with slaked lime at 4 oz. per square yard. To sow, take out a flat-bottomed trench 3 in. deep, and set the beans along this 6 in. apart.

There should be 3 ft. between each trench. Earlier crops may be obtained by sowing in heat in January, hardening off and planting out in March. Successional sowings can be made up to the end of May; late sowings are subject to Black Fly.

BEST TO GROW.—*Long Podded:* "Bunyard's Exhibition" and "Masterpiece." *Green Seeded:* "Johnson's Wonderful." *Broad Podded:* "Harlington Windsor" and "Green Windsor."

BEANS, CLIMBING FRENCH. — These are climbing varieties of French beans which can be grown in the same way as scarlet runners.

VARIETIES. — "First in the Field," "Climbing Canadian Wonder."

BEANS, DWARF KIDNEY or FRENCH, *Phascolus vulgaris* (Leguminosæ).—Half-hardy annuals. For the early outdoor crops sow seeds in boxes in April in a temperature of 55°, hardening them off gradually before planting out. When transplanting, bury the young plants right up to the first two leaves, setting in single rows with 6 in. between each plant. The first outdoor sowing can be made the first week in May if the weather is right, or not until June in very cold districts. Sow in drills 3 in. deep and 3 ft. apart, placing the beans in double lines in each drill so that they are 6 in. apart each way, and covering with 2 in. of soil.

BEST TO GROW.—"Canadian Wonder Improved," "Superlative," "The Prince."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BEANS, HARICOT.—Types of dwarf French beans are grown on to maturity for the production of seeds to be used in winter. Grow in exactly the same way as ordinary French beans but, instead of gathering, allow all the pods to ripen. Just before the frosts come in autumn hang the plants in convenient bundles in a dry, airy shed. Afterwards the seeds can be shelled out and stored dry until required for use.

BEANS, SCARLET RUNNER, *Phaseolus multiflorus* (Leguminosæ).—Grow in the same way as French beans, but make sure that the ground is trenched 1 ft. deep and has a 3-in. layer of well decayed manure at the bottom of each trench. If supports are not used, the tips of the plants must be pinched out to make them branch.

BEST TO GROW.—"Improved Painted Lady," "Scarlet Exhibition," "Best of All," "Ne Plus Ultra," "Rajah."

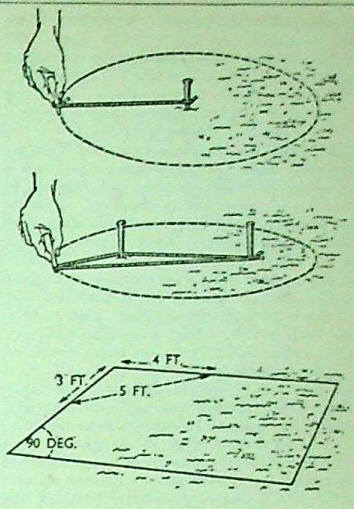
BEAUFORTIA (Myrtaceæ). — Greenhouse evergreen flowering shrubs. *Soil:* Equal parts leaf mould, loam and peat, with a little charcoal. Repot and prune in spring. *Increase:* By cuttings.

BEAUMONTIA (Apocynaceæ). — Stove climbers. *Soil:* Equal parts lumpy loam and peat, and one-sixth sand. Pot in March. Minimum temperature, 60°. *Increase:* By cuttings.

BEDS AND BEDDING OUT.—Formal flower beds cut in a lawn, or formal beds in a paved garden, that are edged with stone, are often planted fresh for each season. That is to say, the beds are prepared in late summer or autumn as soon as the summer flowers pass their prime, and planted with evenly distributed lines or masses of spring flowers. Bulbs carpeted with such plants as arabis or aubrietia, polyanthus or double daisies are favourite for the spring garden.

In the spring, when the bulbs have faded, the beds are again dug over, manured if necessary, and as soon as the danger of frost is past, summer-flowering plants—commonly called "summer bedding plants"—are set out. These may be either annuals, raised from seed in the cold frame or nursery bed, or they may be half-hardy perennials such as the popular geraniums, fuchsias, marguerites, etc. If annuals are used these are, of course, dug in when the beds are cleared for the bulbs, but if perennial plants are employed they are lifted and packed into boxes or pots to be wintered in the cold frame or greenhouse.

The use of bedding plants in this way is not recommended as a practice to be widely adopted where either money or labour is scarce. The plants are more costly than any other subjects, as they must be renewed annually and the labour involved is considerable. Apart from this, the labour of keeping the edges of the beds neat is considerable where the beds are cut from a lawn. Probably the best place for formal bedding of this type (apart from the formal or sunk garden) is where small beds are made on a terrace, and it is desirable to keep these filled with colour all the year round.



MARKING OUT BEDS

If one uses these methods of laying out circular, oval and rectangular beds it is possible to achieve an exactness of shape

BEECH, *Fagus* (Cupuliferæ).—Deciduous trees that thrive particularly well in chalky soil. Plant in October or November. No pruning necessary. *Increase:* By seed, except in the case of named varieties, which are grafted.

BEETROOT.—*Beta vulgaris* (Chenopodiaceæ).—This plant is a true biennial. That is to say, it makes a fleshy root from seed during the first year of growth, and uses the food stored in this during the second season, when it throws up a flowering stem. After the production of seed it dies. Grown as a vegetable, the plants are treated as annuals, the roots being lifted and stored for use at the end of one season. The soil required is deep rich loam, preferably rather light, with good drainage. Sow the seeds *where they are to grow* in drills two inches deep and 12-18 in. apart, according to the variety of beet. The seed can be sown along the drills either scattered thinly along the whole length, or set

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in groups of 3 or 4 seeds every 6 in. If the soil is moist and the weather warm, the seed should germinate in about a fortnight.

BEST TO GROW.—*Globe:* "Egyptian," "Crimson Ball," "July Globe." *Long Varieties:* "Dell's Crimson," "Pineapple," "Green Top," "Covent Garden."

BEGONIA (Begoniaceæ). — Tender, fibrous- and tuberous-rooted perennials valuable for their ornamental leaves, as well as for their showy flowers. Suitable for bedding, for greenhouse cultivation, and for hanging baskets, according to variety. *Soil:* Equal parts leaf mould and loam, with one part dried cow manure and silver sand This is used for pot cultivation. In the open ground, any ordinary good garden soil will suffice. Soot and bonemeal are also useful additions. *Increase:* Seeds of all kinds of begonias can be raised in a temperature of 60° in January, the seedlings being potted on as required, and plants for bedding being moved to the open ground in June, when all danger of frost is past. The fibrous-rooted begonias are increased by basal cuttings, potted up and kept in the warm greenhouse through the winter. The large-leaved begonias are often increased by leaf cuttings. Tuberous begonias are usually lifted and stored for the winter and restarted into growth in February or March. The best way is to pot the tubers into shallow boxes containing a mixture of loam, leaf mould and sand.

BELAMCANDA, Leopard Flower (Iridaceæ). — Half-hardy perennial. *Soil:* Light, rich, sandy, in the open garden, or, if grown in pots, two parts sandy loam, one part leaf mould or decayed cow manure. Pot in November. Five tubers can be grown in a 5-in. pot, the pots being covered with coconut-fibre refuse until growth commences. Minimum temperature, 40°. Outdoors set the tubers 4 in. deep and 2 in. apart any time from September to January. A sunny, well-drained border is necessary. *Increase:* By offsets.

BELLADONNA LILY.—*See* AMARYLLIS.

BELLIS, Daisy (Compositæ).—This is the family of daisies which are regarded as weeds when growing on a lawn. The double varieties are, however, extremely useful for edging borders, particularly because of their hardihood. Flowers will often open in mid-winter. *Soil:* Ordinary. *Increase:* By seed sown in the open in June or by division of the roots, after flowering.

BELLIUM (Compositæ).—Dwarf daisy-like annuals and perennials. *Soil:* Sandy loam, with sun and shelter. *Increase:* By division, or by seeds.

BELOPERONE (Acanthaceæ). — Stove evergreen flowering shrubs. *Soil:* Equal parts loam, leaf mould and sand in a shady, moist position. Pot in March. Minimum temperature, 60°. *Increase:* By cuttings in early spring.

BENEFICIAL INSECTS.—Not all insects in the garden are harmful. Some are definitely helpful to the gardener. The following are some of the common insects which should be encouraged, and not destroyed:

Ladybirds: Too well known to need description. *Hoverflies:* The name describes these flies, which are somewhat like a wasp but hover apparently motionless over plants. *Lacewing flies:* These are beautiful flies with large eyes and long filmy wings. *Ichneumon flies:* These are generally recognized by their slender waists and the constant vibration of the antennæ. *Testacella slug:* An underground slug, dirty yellow in colour, with a small shell on its back. *The Devil's Coach Horse:* These are large black beetles, with a peculiar way of cocking up their tails. *Ground beetles:* Long, oval insects of a metallic colour, almost black. *Centipedes:* These should not be confused with millipedes. The centipede has longer antennæ, a flat body, and only one pair of legs to each segment. (Millipedes are harmful.)

BERBERIDOPSIS (Flacourtiaceæ). — An evergreen climbing shrub. *Soil:* Peaty loam Position, partially shaded, but trained on a warm, sheltered wall, or among rhododendrons. *Increase:* By seeds, cuttings or layers.

BERBERIS, Barberry (Berberidaceæ).— Evergreen or deciduous shrubs. *Soil:* Ordinary. These shrubs are not particular as to position, and many of them are useful to form undergrowth in shrubberies and wild gardens. *Increase:* By seeds or cuttings.

BEST TO GROW.—*B. aquifolium,* the well-known evergreen mahonia, does well in shade. *B. Darwinii,* striking flowers of orange yellow, freely produced in April and May, followed by dark blue berries, 8 ft. *B. Gagnepainii,* a compact shrub, 3-4 ft., with purple-black fruits. *B. japonica,* very striking, somewhat like the ordinary mahonia, but with long racemes of pale yellow flowers very sweetly scented; the flowers open in winter, making this a very desirable plant for the winter garden. *B. stenophylla,* a garden hybrid between *B. Darwinii* and *B. empetrifolia,* excellent for specimens, for planting sloping banks or for hedges, 8-10 ft., flowers golden yellow on long arching sprays. *B. Thunbergii,* hanging yellow flowers in spring, followed by brilliant red berries, foliage turns scarlet in autumn. *B. vulgaris,* common barbery,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with bright red berries. *B. Wilsonæ*, the finest of the dwarf barberries, berries in clusters, changing from cream to bright coral.

BERCHEMIA (Rhamnaceæ). — Deciduous climbing shrubs. *Soil:* Moist loam. *Increase:* By cuttings or layers.

BERTOLONIA (Melastomaceæ).—Stove trailing plants with ornamental foliage. *Soil:* Equal parts peat, leaf mould and sandy loam. Pot in February or March, and keep in shade, under a bell glass. *Increase:* By cuttings or division.

BESSERA, Coral Drops (Liliaceæ).——Half-hardy bulbs suitable for the cool greenhouse, or the foot of the south wall in a well-drained border. *Soil:* Loam, leaf mould, peat and silver sand. *Increase:* By offsets.

BIENNIAL.—A true biennial is a plant which normally lives for two years. During the first season it makes leaf growth, and stores food in its leaves and roots; during the second season it throws up a flowering stem, seeds, and dies. A great many perennials are grown as biennials, the reason being that the first season's flowers are of better quality, or more suitable for formal bedding. Wallflowers and sweet williams are good examples of perennials grown as biennials; canterbury bells are a good example of true biennials.

BIG BUD.—A pest which attacks black currants. (*See* PESTS AND DISEASES.)

BIGNONIA (Bignoniaceæ).—Greenhouse and hardy climbing plants. *Soil:* Two parts loam, one part leaf mould, half part sand. Repot in spring and keep in a sunny position. Prune in February. *Increase:* By cuttings.

BIRCH, *Betula* (Betulaceæ).—Deciduous trees, mostly remarkable for their ornamental bark. *Soil:* Ordinary, or poor and gravelly. *Increase:* By seeds, layers or grafting

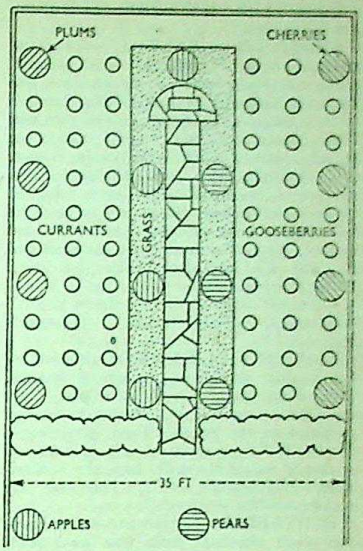
BIRD CHERRY.—*See* PRUNUS PADUS.

BIRDS.—On the whole birds should be encouraged in the garden. They are the natural enemies of insects, and help to keep down the number of pests. Young birds are fed almost exclusively on animal food, and almost every bird can be said to earn its keep. It is better to protect fruits and buds with netting or black cotton thread than to drive away the birds.

BIXA, Annatto (Bixaceæ). — Evergreen stove tree. *Soil:* Two parts loam, one part peat and silver sand. Pot in March. Minimum temperature, 60°. *Increase:* By cuttings.

BLACK SPOT.—A fungous disease that attacks roses. Spray with bordeaux mixture or liver of sulphur.

BLANCHING.—The exclusion of light from any growing plant prevents the formation of green matter. In a number of vegetables the exclusion of the light results in an improved taste, as the green matter is often rather bitter.



Small fruit gardens can be decorative as well as useful by planting bush fruits in grass either side of a path leading to a seat

BLANKET FLOWER. — *See* GAILLARDIA.

BLIGHT.—A term commonly given to many kinds of fungous diseases and pests. (*See also* PESTS AND DISEASES.)

BLUEBELL.—*See* SCILLA.

BLUMENBACHIA (Loasaceæ).—Half-hardy annuals, biennials and perennials, twining. *Soil:* Ordinary, against a south wall. *Increase:* By division or seeds.

BOCCONIA (Papaveraceæ).—*Soil:* Rich, heavy. *Increase:* By suckers or cuttings.

BEST TO GROW.—*B. cordata*, creamy buff flowers, 9 in. in height, useful for the back of a border. Generally called "Plume Poppy."

BOMAREA (Amaryllidaceæ). — Greenhouse climbing perennials. *Soil:* Four parts loam, two parts leaf mould, one part sand. Minimum temperature, 45°. Repot in March. *Increase:* By seed or division.

BONEFLOUR.—*See* FERTILIZERS.

BONEMEAL.—*See* FERTILIZERS.

BORAGE, *Borago* (Boraginaceæ). — Hardy annuals and perennials, suitable for dry, sunny places. *Soil:* Ordinary. *Increase:* By seeds sown freshly each year.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BORDEAUX MIXTURE.—*See* PESTS AND DISEASES.

BORECOLE or KALE, *Brassica oleracea acephala* (Cruciferæ). — A biennial plant usually grown as an annual, and specially valuable as a food crop because of its hardiness. There are several different types, some with short leafy shoots or sprouts, others with large curly leaves. *Soil:* Ordinary, deep, well cultivated. Sow the seeds in April. Earlier sowing is inadvisable, as the plants are inclined to bolt. Protect the seedlings from birds and slugs. Plant them out from the seed bed in rows 2½-3 ft. apart, allowing 2 ft. between each plant.

BEST TO GROW.—"Crested Frost Proof," "Victoria," "Arctic Curled," "Cottager's Kale."

BOUGAINVILLÆA (Nyctaginaceæ).—Stove and greenhouse climbing plants. *Soil:* Four parts loam, two parts leaf mould, one part sand. Repot February, or plant in the border of the greenhouse. Prune back previous year's growth to within 2 in. of the base annually. Minimum temperature, 55°. *Increase:* By cuttings—with a "heel."

BOUVARDIA (Rubiaceæ).—Greenhouse evergreen shrubs. *Soil:* One part peat, half part leaf mould and silver sand. Prune and repot at the end of March. Minimum temperature, 50°. *Increase:* By cuttings.

BOX, *Buxus* (Euphorbiaceæ). — Evergreen shrubs suitable for any soil or aspect, and useful under the drip of trees, or in poor chalky soils. Plant in April or September. Clip during the summer as often as necessary. These shrubs are often used for topiary work. *Increase:* By cuttings or layers.

BRACHYCOME, the Swan River Daisy (Compositæ).—Half-hardy annual. *Soil:* Ordinary. Position, sunny. Sow under glass in March and plant out in May, or sow in April where the plants are to flower. Thin to 6 in. apart.

BRACHYGLOTTIS (Compositæ). — A splendid seaside shrub, with silver bark and green leaves that are silvery beneath. The flowers are small and mignonette-scented. It is suitable only for very mild districts.

BRASSICA.—*See* BORECOLE, BROCCOLI, BRUSSELS SPROUTS, CABBAGE, CAULIFLOWER, KOHL RABI, MUSTARD.

BRAVOA, Scarlet Twin Flower (Amaryllidaceæ).—Half-hardy bulbs, suitable for the greenhouse, or a well-drained, sunny border of light, sandy soil. Pot in October and treat in the same way as spring-flowering bulbs.

BREAK.—A plant is said to "break" when its shoots make fresh growth after the tips have been pinched out. A break occurs sometimes without pinching and this is termed a "natural break." Tulips are said to "break" when the flowers become "feathered" or "flamed," instead of one colour.

BREASTWOOD. — The young twiggy growths which come out at right angles to the wall or support in the case of wall-trained trees. These are cut out to keep the plant the desired shape.

BROCCOLI, *Brassica oleracea botrytis asparagoides* (Cruciferæ). — Broccoli and cauliflowers are often regarded as the same thing, but the gardener has to distinguish between the two. Broccoli is thicker and coarser leaved, and matures during the winter and spring. The season for cauliflowers is late summer. Sow seeds in March or early April in gentle heat or in a very sheltered warm border. Transplant when a few inches high to prepared beds, spacing the plants 6 in. apart. Move to permanent quarters at the end of May or early June. Seeds may also be sown from the middle of April to the beginning of May in a prepared bed, transplanting as before. The plants from this later sowing may follow peas or potatoes. When the winter is severe, the heads may need protection, but often it is sufficient to break a few of the leaves and fold them over the heads.

BEST TO GROW.—For use at the end of the year: "Veitch's Self-Protecting," "Snow's Winter White," "Michaelmas." For early spring: "Leamington," "Evesham Giant." For late spring: "Eastertide," "May Giant," "Whitsuntide."

BROCCOLI, Purple Sprouting.—This is the vegetable usually sold in the markets under the name of broccoli. Its cultivation is exactly similar to that of ordinary broccoli, the sprouting side shoots being gathered as required for use. The flavour is enhanced by frost. There is also a white sprouting broccoli.

BROCCOLI, Roscoff.—A variety raised by French market gardeners. Its chief virtue is its extreme hardiness and its abundant cropping qualities.

BRODIÆA (Liliaceæ). — Hardy deciduous bulbs. *Soil:* Rich sandy loam in a warm, well-drained border. Set the bulbs 4 in. deep and 3 in. apart, and lift and replant annually. They can also be grown as pot plants. *Increase:* By seeds or offsets.

BROWALLIA (Solanaceæ).—Half-hardy annuals and perennials suitable for the cool greenhouse. *Soil:* Light, sandy loam and leaf mould. Sow in October to flower the following summer.

BRUNSVIGIA, the Candelabra Flower (Amaryllidaceæ).—Greenhouse bulbs. *Soil:* Equal parts fibrous loam, peat and sand. Should be repotted in autumn. Minimum temperature, 50°. *Increase:* By offsets.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BRUSSELS SPROUTS, *Brassica oleracea bullata gemmifera* (Cruciferæ).—*Soil:* Any good garden soil so long as club-root is not prevalent. The crop repays liberal treatment. Sow in gentle heat in March, pricking off, hardening, and finally planting out in April. Outdoor sowings can commence in early April and can be continued until the middle of June. From 30-40 weeks is the usual time that the plants take to mature. Seeds are generally sown broadcast, and when planting out the seedlings are set in up to the first pair of leaves. Except for the very dwarf kinds the plants should be at least 3 ft. apart each way.

BEST TO GROW.—"Dwarf Gem," "Darlington," "Covent Garden."

BUDDING.—*See* PROPAGATING PLANTS.

BUDDLEIA (Loganiaceæ).—Deciduous and evergreen shrubs, mostly hardy. *Soil:* Ordinary rich. Open sunny position. Plant October to March. *Increase:* By cuttings 4 in. long in late summer. Pruning must be regularly carried out in the case of *Buddleia variabilis*, but *B. globosa* and *B. alternifolia* need only a little old wood removed after flowering.

BULB FLIES and BULB MITES.—*See* PESTS AND DISEASES.

BULBOCODIUM, Spring Meadow Saffron (Liliaceæ).—Hardy bulbous plants which will grow in any ordinary soil in sunshine or shade. Plant 3 in. deep and 3 in. apart in autumn. Lift and replant every two years. *Increase:* By offsets.

BULBOPHYLLUM, Stove epiphytal orchids.—*See* ORCHIDS.

BULBS.—Bulbs are fleshy underground growths, actually the fleshy base of leaves, in which plant food is stored. A great many plants that we grow in our gardens have the habit of forming bulbs during the season of growth. The tops disappear entirely during the resting period, but because of the food stored in the bulbs, the plants are able to grow quickly to the flowering stage when the rest is over. In the case of spring-flowering bulbs this habit is of great importance, as it allows the plants to reach the flowering stage in woods, and under trees, before the overhead foliage causes dense shade.

Bulbs, Spring-flowering.—The outdoor cultivation is very much the same for all spring-flowering bulbs. They do not require very rich soil, since the amount of food required to produce the flower spike is already stored in the bulb. If planted in poor soil, however, the bulbs will gradually deteriorate after the first season, and a wise practice, therefore, is to use ground which is manured regularly. Bulbs must not, however, be put in direct contact with fresh manure. When the summer annuals have been cleared from the garden, dig over the soil and add a dressing of lime, and if it is poor add some bonemeal. Then set out the bulbs on the surface of the soil in the position in which they are to grow. In this way, formal bedding schemes can be accurately arranged. Make holes with a trowel or dibber, and plant the bulbs so that twice their own depth of soil is over them. The base of each bulb should rest on soil, preferably on soil of a porous nature. When planting in sticky clay put a handful of sand under each large bulb. If carpet plants, such as arabis or aubrietia, are to be used with bulbs, these should be planted before the bulb holes are filled in.

To plant bulbs in turf, special bulb planters are sold. These lift out a piece of turf sufficient to allow for the insertion of the bulb, and when the next hole is made the first piece of turf is automatically pushed out of the tool and left lying on the surface. These pieces of turf can be broken up finely and left as a top dressing after the planting is finished. If this tool is not used, an easy method of sowing bulbs under grass is to lift square pieces of the grass with a spade, lightly fork the soil below, and press the bulbs into it. Then replace and roll the turf. Such bulbs look best if they are in natural drifts, and this effect is achieved if handfuls of bulbs are thrown over the ground and then planted where they fall.

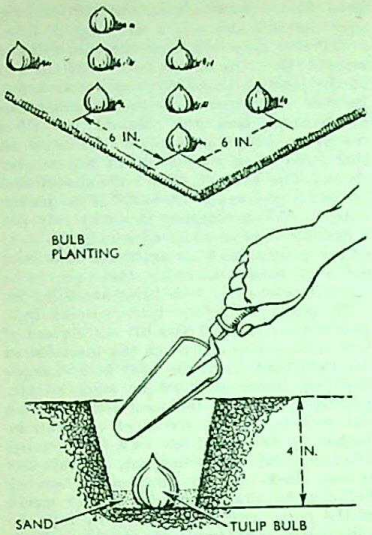
Bulbs, Summer-flowering. — The same rules for planting apply to summer-flowering bulbs. Nearly all bulbs prefer gritty, well-drained soil, and when planted in clay should have their bases resting on sand. The bulbs classed as summer-flowering are, as a rule, those kinds which are not hardy enough to stand the British winter outdoors, and they are therefore lifted when the flowering period is over and the foliage has died down, and stored in a frost-proof place.

Gladioli can be hung in bunches, but some bulbs are better stored in sand or ashes to keep them from drying out too quickly. In all cases when bulbs are lifted the work should not be done *until the foliage has turned yellow*, as while the foliage is green, food is still being manufactured to be stored in the bulbs for another season's growth.

Bulbs Indoors.—Bulbs can be grown in pots of soil either in the house or in the greenhouse. In the case of the spring-flowering bulbs the best method is to pot the bulbs in autumn, using plenty of crocks, and a compost of fibrous loam and sand. The tips of the bulbs can be about level with the surface of the soil, that is about 1 in. below the rim of the pot. Stand the pots for a few weeks in an even

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



How tulip bulbs should be planted. The use of sand is advisable with heavy soil

temperature in a dark, airy place. The cold frame, with 3 or 4 in. of ashes over them, is a very good place to start bulbs, which must be watered at the time of potting but not allowed to get too wet afterwards. When the tops begin to grow the pots can be brought indoors and gradually into more light and more heat.

Bulbs in Bowls.—Almost any bulbs can be grown in bowls of prepared fibre. The advantage of this method is that the bowls require no drainage and are therefore cleaner when growing in the house rooms. Moisten the fibre before use so that it is damp enough to hold together when squeezed, but not moist enough for moisture to be squeezed from it. Choose bowls according to the size of the bulbs, remembering that narcissi generally need a deeper bowl than hyacinths. Half-fill the bowls with fibre, and press the bulbs into this, using sufficient numbers nearly to touch one another but not quite. (Use only one variety in each bowl, as mixed varieties seldom flower together.) Then fill in more fibre to within ½ in. of the rim of the bowl. The tips of the bulbs should just protrude above the fibre.

Bulbs in Water.—Because bulbs already have a store of plant food, they can be grown even without soil. The well-known hyacinth glasses can be used, the only care needed being to see that the water reaches nearly, but not quite, to the base of the bulbs. It will have to be replenished from time to time as it is used up. Smaller bulbs, such as crocuses, can be grown in shallow bowls or saucers of pebbles, again allowing the base of the bulbs to reach nearly to the water. If crocuses are grown in this way, do not keep them in a warm room, but grow them in quite cool conditions until the flowers begin to open.

BULRUSH.—*See* SCIRPUS.

BUPHTHALMUM (Compositæ). — Hardy and greenhouse perennials. *Soil:* Ordinary. Position, sunny. *Increase:* By division. These plants have heads of bright yellow flowers during the summer and autumn.

BUPLEURUM (Umbelliferæ). — Evergreen shrubs and perennials. Shrubs not generally hardy, but useful in seaside gardens and on chalky soils. *Increase:* By division.

BURBIDGEA (Zingiberaceæ). — Stove herbaceous perennials. *Soil:* Equal parts peat, leaf mould and loam. Plant in large pots, tubs or beds in March. *Increase:* By division.

BURCHELLIA (Rubiaceæ). — Stove evergreen shrubs. *Soil:* Equal parts loam, peat, leaf mould and sand. Pot in March. Minimum temperature, 55°. *Increase:* By cuttings.

BURGUNDY MIXTURE.—A substitute for Bordeaux mixture.

BURR MARIGOLD, *Bidens grandiflora* (Compositæ).—Annual herbs, useful for planting in the sunny border or by the waterside. Sow seed under glass and plant out into the open in May. The plants produce yellow flowers in summer.

BUTCHER'S BROOM, *Ruscus* (Liliaceæ).—Evergreen shrubs belonging to the asparagus section of the lily family. Fresh stems rise from the base of the stems in the same way as asparagus. *Soil:* Ordinary. A position in the shade, or under trees, is quite suitable. *Increase:* By division in spring.

C

CABBAGE, *Brassica oleracea* (Cruciferæ).—The numerous garden varieties of cabbage are descendants of the native wild cabbage to be found in several districts in Great Britain. They have been evolved into two main groups—those sown in summer to mature the following spring, called "spring cabbage," and those sown in spring to mature in summer and autumn, and called "autumn cabbage."

The first sowing of autumn cabbage should be made under glass in March, with successional sowings up to the beginning of June. For spring cabbage, the end of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

July is usually early enough, with a second sowing in August. It is essential to dig the ground deeply and treat it regularly with lime where this class of plant is grown. The distance apart to set cabbages of all kinds depends on the size of the mature plants.

BEST TO GROW.—*Spring Cabbage*, "Ellam's Early," "Flower of Spring," "Harbinger." *Autumn Cabbage*, "Primo" and "Winningstadt."

CABBAGE CATERPILLARS. — *See* PESTS AND DISEASES.

CABBAGE MOTHS, *Mamestra brassicæ*.—The cabbage moth lays its eggs on the leaves of plants in late summer. The caterpillars hatch, in about seven days, and attain a length of about 1½ in. The colour varies from pale green to dark brown. When they are full-grown the caterpillars leave the plants for the ground, and change into a brown chrysalis. The moth appears in the following summer, with upper wings of dark grey to black.

The best method to treat the pest is to spray with salt solution in late summer.

CABBAGE, SAVOY, *Brassica oleracea bullata major* (Cruciferæ).—Sow as advised for borecole. For an early crop, seeds of a dwarf variety can be sown in boxes in a frame in February. Thin drastically, or transplant, at an early stage. Set out 15 in. to 2 ft. each way, according to variety. Artificial fertilizer should be applied at the rate of 4 oz. per square yard in September and lightly hoed in.

BEST TO GROW.—"Dwarf Green Curled," "Drumhead," "Tom Thumb," "Sugar Loaf."

CACALIA, Tassel Flower (Compositæ). —Hardy annuals with scarlet or golden flowers, and they are suitable for sowing in poor soils.

BEST TO GROW.—*C. coccinea*, scarlet, summer, 1-2 ft.

CACTUS (Cactaceæ).—There was a time not so long ago when cactus cultivation was a popular hobby. Evidence of this popularity is still to be found in the glass-enclosed windows of many Victorian houses. These are, in effect, miniature greenhouses, and were a common feature of Victorian drawing-rooms and parlours. There are signs that cacti are again becoming subjects of popular interest. We are certainly learning more and more about the habits and needs of this large family of plants.

As regards general methods of cultivation, all cacti and succulents may be grouped together, though the family Cactaceæ is a large one in which there are many divisions and sub-divisions. Contrary to popular belief, cactus plants do not need tropical conditions in every case, neither is it necessary for them to grow in waterless deserts.

General Cultivation.—A greenhouse or a sunny window will do for the cultivation of cacti. The only points to remember are to exclude frost and to avoid excessive moisture. There are only a few cacti which can stand frost. Cacti generally grow in pots, though this is not essential. Before planting, pots should be scrubbed with disinfectant, rinsed and dried. Quarter-fill each pot with broken crocks. Use ordinary garden soil free from humus and manure, mixing two parts of this with one part of clean sand.

Burnt clay is often recommended, but after much watering this is inclined to cake. A fairly lumpy soil is, however, better than very fine soil. When planting, hold the cactus in the centre of the pot and trickle the soil round it. A little bonemeal with the bottom layer of soil in the pot will be appreciated, and lime rubble in small pieces should also be added. In spring a little stimulant can be given in the form of bonemeal, salt, or a complete fertilizer. Cacti do not need such frequent watering as ordinary plants, but must be given plenty of moisture, particularly in hot weather. In September and October, watering once a week will be sufficient. From then until February once a fortnight, and in February and March the water supplies can be gradually increased again. The opuntias and cereus need more water than the other groups. *Increase:* Cuttings of cactus can easily be rooted. Cut them with a sharp knife and leave them exposed for 24 hours, during which time a skin will form over the cut portion. Plant in sandy soil, being careful not to bruise the new skin. Do not water for a fortnight, and as soon as the plant shows signs of growth, pot in the usual soil. It generally takes two or three weeks for a plant to root. Any cactus plant cut into pieces will root easily this way.

CÆSALPINIA (Leguminosæ). — Deciduous shrubs with fern-like leaves and pea-shaped flowers, which are yellow with red stamens. *Soil:* Loam. Greenhouse protection is necessary. *Increase:* By seeds and layers.

CAKILE, Sea Rocket (Cruciferæ).—Hardy annual suitable for seaside districts. *Soil:* Sandy loam. *Increase:* By seeds.

CALADIUM (Aroideæ).—Stove perennials grown for their decorative leaves. *Soil:* Equal parts loam, leaf mould and sand, with a quantity of decayed cow manure. Pot in spring, moving into larger pots only when the roots touch the sides of the pots. Give plenty of water in summer; keep dry November to February. *Increase:* By division at potting time.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CALAMINTHA (Labiatæ). — Annuals and perennials suitable for carpet plants in summer. *Soil:* Sandy loam. Position, sunny. *Increase:* By seeds in March or division in March or September.

BEST TO GROW.—*C. acinos* (annual), Basil Thyme, purplish blue, July, 6 in. *C. alpina*, suitable for rock garden, June-July, 4 in.

CALAMUS, Rattan Palm (Palmaceæ).— Stove evergreen climbers with ornamental foliage. *Soil:* Two parts turfy loam, one part leaf mould and sand. Position, shady. Minimum temperature, 60°. *Increase:* By seeds or suckers.

CALANDRINIA (Portulaceæ). — Half-hardy annuals. *Soil:* Sandy, in a sunny position. *Increase:* By seeds sown in the cool greenhouse in February, and planted out in May or June.

CALANTHE.—Stove terrestrial orchids. For cultivation *see* ORCHIDS.

CALATHEA (Marantaceæ). — Stove plants with ornamental foliage. *Soil:* Equal parts loam, peat, leaf mould and sand, in a shady position. Minimum temperature, 65°.

Water freely in summer. *Increase:* By division in March.

CALCEOLARIA (Scrophulariaceæ). — Half-hardy and herbaceous perennials generally grown in the greenhouse. *Soil:* Loam, leaf mould and fine sand in a semi-shady position. Sow in pans in June, covering the seeds very lightly as calceolarias cannot stand firm potting. Move them into larger pots as required. Minimum temperature, 45°.

When repotting, care must be taken as any check will probably be fatal. When the plants are firmly established, they will appreciate weak doses of liquid manure, given once a week.

BEST TO GROW.—There are numerous modern hybrids and varieties, chiefly descendants of *C. corymbosa* and *C. crenatiflora*. Two of the best are *C. Clibrani*, yellow, and "Albert Kent," yellow and bronze.

CALENDULA (Compositæ). — Hardy annuals. (*See* MARIGOLD.)

CALLA, Bog Arum (Aroideæ).—Hardy aquatic with small white flowers. (*See* WATER PLANTS.)

CALLICARPA (Verbenaceæ). — Deciduous shrubs with ornamental foliage in autumn. *Soil:* Ordinary. Winter protection necessary. *Increase:* By cuttings.

CALLIOPSIS, *Coreopsis* (Compositæ).— Hardy annuals, excellent for bedding and cutting, and very suitable for cultivation in town gardens.

The perennial coreopsis is dealt with under that name, as seedsmen usually distinguish them in this way. *Soil:* Ordinary. *Increase:* By seeds sown where they are to flower, March to May.

BEST TO GROW. — "Crimson King," dwarf, scarlet-maroon. "Star of Fire," dwarf, suitable for edgings. "Coronata," yellow, tall and showy.

CALLIPHRURIA (Amaryllidaceæ). — Half-hardy bulbous plants, with pretty white flowers in June. Foliage like that of the Guernsey lily. *Soil:* Sandy loam and peat. *Increase:* By seeds and offsets.

CALLIRHOE, Poppy Mallow (Malvaceæ).—Hardy annuals and perennials, excellent for rock garden cultivation. *Soil:* Ordinary, well drained. Position, sunny. *Increase:* By cuttings in September or March and by seeds sown in March or April in the open.

CALLISTEMON (Myrtaceæ). — Greenhouse evergreen shrubs. *Soil:* Equal parts turfy pear, loam and sand, well drained. Prune when necessary after flowering. Minimum temperature, 45°. *Increase:* By seeds or cuttings in summer.

CALLISTEPHUS.—*See* CHINA ASTER.

CALLOSTEMMA (Amaryllidaceæ). — Greenhouse bulbous-rooted plants. *Soil:* Two parts loam, one part leaf mould, half part sand. Position, light, sunny. Minimum temperature, 45°. *Increase:* By offsets.

CALLUNA, Ling, Scotch Heather (Ericaceæ).—These plants are probably the best bee flowers of the native flora, and the honey is highly popular. Distinguished from ericas, the true heathers, by the large coloured calyx with the four minute bracts at the base, called the "outer calyx." Soil and cultivation similar to that recommended for heather.

CALOCHORTUS (Liliaceæ).—Summer-flowering, bulbous plants, suitable for the border. *Soil:* Sandy loam, leaf mould and road grit. Plant from September to March, setting the bulbs 3 in. deep and 4 in. apart. Position, sunny, with protection in winter. *Increase:* By seeds sown in the cool greenhouse, by offsets or bulbs.

CALODENDRUM (Rutaceæ).—Greenhouse evergreen flowering tree. *Soil:* Turfy peat, loam and sharp sand. Light, sunny position. Prune in early spring. *Increase:* By cuttings in July.

CALTHA, Marsh Marigold (Ranunculaceæ).—Hardy perennials suitable for bog and waterside. Plant October or March. *Increase:* By division.

CALYCANTHUS, Allspice (Calycanthaceæ). — Hardy deciduous flowering shrubs. *Soil:* Two parts peat, one part loam, and leaf mould. Sunny position. *Increase:* By seeds, cuttings or layers.

CALYSTEGIA (Convolvulaceæ). — Hardy deciduous perennials suitable for climbing over trellises, etc. *Soil:* Any ordinary. *Increase:* By seeds or division.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CAMASSIA (Liliaceæ)—Hardy bulbous plants. Flowers suitable for cutting. *Soil:* Loam, leaf mould and sand in equal parts. Plant in autumn, setting the bulbs 4 in. deep and 9 in. apart. *Increase:* By seeds or offsets.

CAMPANULA (Campanulaceæ).—Hardy annuals, biennials and perennials. Suitable for rockeries or border edging, and the tall kinds for herbaceous borders and also for greenhouse cultivation. *Soil:* Ordinary. Position, sunny borders, though some species will do very well in half-shade. For pot culture the soil should consist of equal parts leaf mould, loam and sand. *Increase:* By seeds sown in spring. Perennial kinds by division of roots in October or April, or by cuttings in March or August.

Some of the most useful species and varieties are as follows: *C. carpatica*, with cup-shaped violet flowers, 9 in. *C. portenschlagiana*, useful for edging, 6 in.; rich violet. *C. pusilla*, a tiny 3-in. harebell that quickly carpets the soil; useful for the rockery or edgings; there are several hybrids of this, varying in colour from white and lavender to a pinkish lilac. *C. glomerata*, the clustered bellflower, blue, for the rockery border. *C. rotundifolia*, blue, for the mixed border.

CANARY CREEPER, Tropæolum peregrinum. — A half-hardy climber. Strictly a perennial, but usually grown as an annual. Seeds can be sown where they are to flower in April, or sown in thumb pots under glass to be transplanted to the open at the end of May. Useful for covering low fences. Flowers, yellow. *Soil:* Ordinary, light.

CANDYTUFT, Iberis (Cruciferæ). — Annual and perennial herbs. The perennials are mostly evergreen and generally grown in rock garden. *Soil:* Ordinary, well-drained. *Increase:* By seeds and, in the case of perennials, by cuttings.

BEST TO GROW.—*Perennials: I. corifolia*, hardy, evergreen, white, June, 3-6 in. *I. semperflorens* and *I. sempervirens*, both suitable for the herbaceous border or rockery.

CANNA (Scitaminaceæ). — Stove herbaceous plants. *Soil:* Loam, leaf mould and sand, with some decayed manure. Pot in March. Minimum temperature, 40°. These plants can be grown in the open from June to Sept., but should be lifted into the greenhouse as soon as the weather turns cooler. *Increase:* By seeds or division.

CANNABIS (Urticaceæ). — Hardy annuals with ornamental foliage, suitable for the border. *Soil:* Ordinary. Position, sunny. *Increase:* By seeds sown in April where they are to grow, or in March in a temperature of 55°; transplant in June.

CAPE GOOSEBERRY, *Physalis* (Solanaceæ). See PHYSALIS.

perennials. The "Cape Gooseberry" is the edible fruited variety, which is tender and is grown in Britain only under glass. Ornamental species of the same genus include *P. Alkekengi*, which is otherwise known as the winter cherry, and is a popular pot plant, and *P. Francheti*. They are grown for the beauty of their inflated calyces. Francheti is the stronger and hardier of the two. *Soil:* Light, rich, in a warm, sunny position. *Increase:* Annually from seeds, or by division in spring.

CAPSICUM, Common Capsicum Solanaceæ).—Grown in England chiefly for decoration, though the fruits are sometimes used for curries, sauces and pickles. *Soil:* Light and warm. *Increase:* By seeds sown under glass annually.

CARAGANA (Leguminosæ).—Deciduous shrubs and small trees. *Soil:* Well drained, damp but not too rich. *Increase:* By seeds or by grafting.

CARAWAY.—*See* CARUM.

CARDAMINE (Cruciferæ) — Hardy perennials useful for borders and shrubberies. *Soil:* Moist, rich. A position in the sun or shade is equally satisfactory.

CARDOON, *Cynara cardunculus* (Compositæ)—Closely related to the globe artichoke. The cultivation differs because the cardoon is grown for the production of edible leaf stalks. Seed should be sown at the end of April, where the plant is to remain, over trenches that are deeply dug and well supplied with manure.

The easiest way is to dibble in three or four seeds at intervals of 18 in. down the centre of the trench. Cover each group with a cloche or an inverted flower pot until the seedlings appear. Remove all but the strongest plant from each group and shade from late frost and scorching sun. Give plenty of moisture during the season and blanch the stems by tying brown paper round them, binding this with hay or straw. Afterwards earth up the plants in the same way as celery.

CARICA, Papaw Tree (Passifloræ).— Tropical fruiting trees grown as stove plants in this country. The leaves are said to make tender any meat that is wrapped in them. *Soil:* Rich loam. Minimum temperature, 50°. *Increase:* By cuttings.

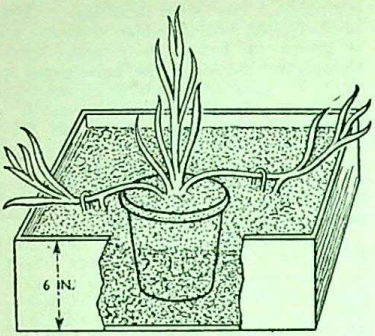
CARLINA (Compositæ). — Stemless thistles, useful in the rock garden. *Soil:* Poor, in full sun. Otherwise the plants tend to grow tall. *Increase:* By seed.

CARMICHÆLIA (Leguminosæ). — Deciduous flowering shrubs, with pea-shaped flowers. *Soil:* Lime-free. Sunny position is required.

CARNATION, *Dianthus* (Caryophyllaceæ).—Hardy annuals and perennials suitable for the rockery and borders, and [illegible] They may

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Carnations will root readily if they are layered in sandy soil during July

be divided into the following types: border carnations, perpetual-flowering carnations, malmaisons, and marguerite carnations.

Border Carnations. — *Soil:* Ordinary, good, well-dug garden soil, with plenty of lime. A sunny position is essential. These plants are the old carnations known in Shakespeare's time. The flowering period is comparatively short, but the double forms in rich colours are among the most delightful of old-fashioned plants. They are recommended for cultivation in difficult gardens, such as town gardens, and also for window boxes and roof gardens. Plant in autumn or spring and increase in July by layering. The young rooted plants should be set about 12 in. apart in groups of half a dozen or more for the best effect.

Perpetual-flowering Carnations.—This is a modern type which has superseded the old malmaison carnation almost entirely. The cultivation of these under glass is the same as that given to the old malmaison. The chief difference is that the modern perpetual-flowering carnation is rather hardier.

Culture under glass. — If plants are obtained in 3-in. pots in spring they should be kept in a light, airy greenhouse or frame until May. After this the pots may be stood in a sheltered spot in the open except during a very wet season. As the roots grow through the bottoms of the pots, repot into larger pots, giving shelter until the plants are re-established. About August the plants can be put into winter quarters, in full sunshine, in a cool, well ventilated greenhouse. Here they should flower from about September until the end of spring. About the beginning of the year there will be several sideshoots growing near the base. These can be taken off as cuttings, rooted in sandy soil, potted up and treated as before. The best shoots for cuttings are shapely, neither dwarfed nor twisted, nor too long and leggy. They may be pulled out at a joint, or taken off with a heel.

Outdoor cultivation.—Young plants, if planted out in the open border from 3-in. pots, will flower from June until the frosts arrive. Trim them back again in spring and they will again flower the next season, but it is advisable always to raise fresh plants annually.

The soil for all kinds of carnations should be heavy loam, to which sharp sand or broken bricks are added, together with wood ashes, burnt earth, and a quantity of lime rubble. Bonemeal is a useful addition to soils of doubtful fertility.

Malmaison Carnations.—These are large-flowered carnations, which can be treated in the same way as perpetual-flowering carnations under glass. They are, on the whole, less hardy than any of the other types, and cannot be flowered in the open border.

BEST TO GROW.—*Hardy border carnations:* Old Crimson Clove, Snow Clove (white), Peach Blossom (pink), Steerforth Clove (white and maroon), Grenadier (scarlet), Border Yellow, Raby Castle (salmon).

Perpetual-flowering carnations: Dilys (yellow with pink edges), Wanda (dark red), Achievement (apricot), Arctic (white), Laddie (light salmon-pink), Red Laddie, Rapture (salmon rose), Wivelsfield Buttercup (yellow).

Hardy perpetual-flowering carnations: Sussex Pink, Sussex Brilliant (white and chocolate), Sussex Dawn (heliotrope, flaked cerise), Hawk (white, spotted crimson), Sussex Rosalind (yellow, red), Highland Lassie (white, edged red).

Perpetual-flowering malmaisons: Atlantic (white, flushed pink), Delicata (pale pink and rose), Jessie Allwood (yellow), Hugh Low (baby pink), Jessie Maze (deep maize), Mrs. C. F. Rachael (cherry).

Marguerite Carnations. — True perennials, but always treated as annuals. Excellent pot plants for the conservatory. They may also be planted out in the open border. They grow to about 2 ft. high, are delightfully fragrant, and contain every colour known to carnations. Sow under glass in January, in soil similar to that used for other carnations.

CARNATION RUST. — A destructive fungus controlled by spraying in winter with diluted Bordeaux mixture, or a weak solution of permanganate of potash. *See also* PESTS AND DISEASES.

CARPENTERIA (Saxifragaceæ).—Evergreen flowering shrubs with anemone-like flowers 2-3 in. across. Excellent for the seaside and warm districts. *Soil:* Rich, with plenty of moisture, and a situation in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pure air, preferably with wall protection inland. *Increase:* By cuttings, suckers or layers.

CARPINUS, Hornbeam (Corylaceæ).—Deciduous trees that thrive on poor, chalky soils. Valuable for hedges as they are of rapid growth. *Increase:* By seeds or grafting.

CARROTS, *Daucus carota* (Umbelliferæ).—The wild carrot is a native of Britain, and carrots should therefore be easy to grow. *Soil:* Light, sandy loam of good depth, or any well cultivated garden soil. If the soil is very heavy, holes can be made with a large dibber and filled up with prepared fine soil, on the top of which carrot seeds are sown. In this way roots of good shape can be grown. Earliest sowings of "Shorthorn" varieties can be made on a mild hotbed from November to February. Seeds can also be sown in the cold frame in February, and the first outdoor sowings in a warm, dry border in March. Sow broadcast, or in drills 6 in. apart. Lift the main crop in October and store in layers of dry sand or earth in a cool, frostproof place.

BEST TO GROW.—*For frames:* "French Horn," "Early Gem," "Early Nantes," "Parisian Forcing." *For main crop on heavy soils:* "Chantenay," "Early Market," "Scarlet Gem." *Main crop on sandy soils:* "Altrincham," "Long Red Surrey," "Wiltshire Giant White." *Main crop on medium soils:* "James Intermediate," "St. Valery," "Prizewinner."

CARTHAMUS (Compositæ). — Hardy annuals. *Soil:* Ordinary. *Increase:* By seeds sown where they are to grow.

CARUM, Caraway (Umbelliferæ). — Hardy biennials, the seeds of which are popularly known as caraway seeds. Sow in the open ground in spring in ordinary soil.

CARYA, Hickory (Juglandaceæ).—Fast-growing deciduous trees. *Soil:* Well-worked, ordinary. *Increase:* By seeds or nuts, packed in boxes of moist earth for the winter, and sown singly in 6-in. pots in the cool greenhouse in spring. Plant out the seedlings at the end of May.

CASSANDRA (Ericaceæ). — Evergreen shrubs with white, heath-like flowers in March and April. *Soil:* Lime-free in partial shade. *Increase:* By seeds or cuttings.

CASSIA (Leguminosæ).—Deciduous and evergreen shrubs. *Soil:* Ordinary, in a sheltered position. *Increase:* By division or seeds.

CASSINIA (Compositæ). — Evergreen shrubs with daisy-like flowers, more valuable for their foliage. *Soil:* Sandy loam or peat. *Increase:* By cuttings.

CASSIOPE (Ericaceæ). — Evergreen heath-like shrubs. *Soil:* Damp and lime-free. *Increase:* By layers and cuttings.

CASTANEA, Sweet Chestnut (Cupuliferæ).—Deciduous trees, valuable for their timber and nuts. Plant in November in sandy, lime-free soil.

CASTOR OIL PLANT, *Ricinus* (Euphorbiaceæ). — Half-hardy annual foliage plants. *Soil:* Fairly rich. Plenty of water. *Increase:* By seeds sown in March, singly, in small pots in heat.

Ricinus communis is the species from which castor oil is obtained.

CATALPA, Indian Bean Tree (Bignoniaceæ).—Hardy deciduous flowering trees. *Soil:* Light, well drained. Plant in February in a sunny, sheltered spot. *Increase:* By seeds and cuttings.

CATANANCHE (Compositæ). — Hardy perennial. The flowers are blue, or blue and white; blooms in June, July and August. 2-3 ft. high. *Soil:* Warm and dry. *Increase:* By seed or division.

CATASETUM. — A stove deciduous orchid, grown in pots or baskets. A curious genus, the flowers of which are sometimes of two or three different forms on the same plant. For cultivation *see* ORCHIDS.

CATESBÆA (Rubiaceæ).—Stove evergreen shrubs with showy flowers allied to gardenias. *Soil:* Sandy loam, with fibrous peat. Minimum temperature, 55°. *Increase:* By cuttings, in April.

CATKIN.—Stemless flowers crowded together on a single spike, often very decorative as they hang from the tree stems. In many cases male and female catkins are on different trees.

CATMINT, *Nepeta Mussini* (Labiatæ). —This is of the same genus as the ground ivy, which is practically a weed, although its variegated form is sometimes used in baskets. Catmint is extraordinarily useful for perennial borders and for the rock garden. Its foliage is fragrant and silvery, and the lavender-blue flowers keep their colour for a long time and make a good background to pink gladioli, thrift, or similar bright pink flowers. *Soil:* Ordinary. *Increase:* From seed, cuttings, or division.

CATTLEYA.—These stove orchids include some of the finest hybrids now in commerce. For cultivation *see* ORCHIDS.

CAULIFLOWER, *Brassica oleracea botrytis cauliflora* (Cruciferæ).—When the soil is prepared for cauliflowers, plenty of stable manure should be added, or, if this is unobtainable, garden refuse may be dug in. Dig deeply, and afterwards dust with slaked lime at the rate of 4 oz. per sq. yd. The soil cannot be too rich.

Seeds may be sown in the cold frame in Jan. or Feb., when the plants will be ready for the table from July to Sept. Outdoor sowing can commence in March. Those sown under glass should be ready for planting out in April. Lift the plants from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

18 in. to 2½ ft. apart, according to variety. When the young heads have just formed, give a dressing of nitrate of soda, 1 oz. per sq. yd.

BEST TO GROW.—*For early supplies:* "Early Bird," "Snowball," and "All the Year Round." *For main crop:* "Autumn Giant," "Improved Eclipse," "Magnum Bonum."

CEANOTHUS (Rhamnaceæ). — Evergreen and deciduous flowering shrubs. *Soil:* Ordinary, in full sun and with the shelter of a wall or fence for most of the evergreen species. Plant in October or March, but not when the soil is wet and cold. Spring-flowering species should be pruned only lightly and that directly after flowering. Late flowering plants of the "Gloire de Versailles" type should be cut back to within an inch or two of the old wood in spring if they are grown on walls. Trim into shape. *Increase:* By cuttings or layers, or by seeds sown in spring.

BEST TO GROW.—*C. azureus*, blue, July. *C. hybridus*, "Gloire de Versailles," blue, June to October, a descendant of *C. azureus* and rather better than the parent. *C. h.* "Marie Simon," pink. *C. dentatus*, bright blue, June-August, evergreen. *C. rigidus*, purplish-blue.

CEDAR.—Suitable for moist loamy soil. *See also* CONIFERS.

CEDRONELLA (Labiatæ).—Greenhouse evergreen with scented leaves. *Soil:* Two parts fibrous loam, one part peat, one part sand. Repot early spring. Minimum temperature, 40°. *Increase:* By cuttings.

CEDRUS.—*See* CONIFERS.

CELASTRUS (Celastraceæ).—Vigorous climbing shrubs with decorative berries. *Soil:* Deep, fairly rich loam. *Increase:* By seeds and layers.

CELERIAC, *Apium graveolens rapaceum* (Umbelliferæ).—This vegetable is closely allied to celery, the difference being that the root, and not the stalk, is used for culinary purposes. The roots resemble turnips, and can be used raw in salads, or boiled and served as a separate dish. Sow in March, in a temperature of 60°, covering the seeds lightly with fine soil. In April the seedlings should be pricked off, and gradually hardened for planting out in May or June. Set the plants 1 ft. apart in drills 1½ ft. apart. Trenches are not necessary for celeriac. All the side shoots should be picked off in August, and the earth ridged up to cover the swollen roots. Lift the roots in October, trim them of foliage and rootlets, and store them in dry earth or sand.

BEST TO GROW.—"Early Erfurt," "Improved Paris."

CELERY, *Apium graveolens* (Umbelliferæ).—To grow celery to perfection, a great deal of labour is needed, but this is more than repaid, as celery is a crop for which there is no proper substitute. Sow in pots or boxes in sandy soil, covering the seeds only lightly. Keep up a minimum temperature of 60°, and when the seedlings have formed 3 leaves, prick them out into boxes of richer soil, setting them 2-3 in. apart each way. Gradually harden-off and plant out in May or June. When the soil is being trenched, 1 spit should be taken out and about 9 in. of well-decayed farmyard manure or garden refuse thrown in.

Well-rotted seaweed also makes good manure. Cover this with 4 in. of good soil and finally with a dusting of lime. The trenches should be 15 in. wide if only single rows are to be planted, or for double rows 18 in. wide, with 3½ ft. between the rows.

Care should be taken when lifting the plants into the trench, and they should be well watered after planting. Earth-up when plants are nearly full-grown. This is for blanching purposes. If no earthing-up were done the celery stalks would be green and bitter. Tie the stalks together with raffia and bank 4 or 5 in. of soil firmly round them.

BEST TO GROW.—Some of the best quick-maturing varieties are: "Dwarf White," "White Gem," "Exhibition White," "Wright's Giant White," "Lancashire Prize Red."

CELERY FLY.—A small brown fly which lays its eggs in the celery plant. The eggs hatch out and the grubs eat into the leaf, mining between the two skins, and leaving transparent patches. *See* PESTS AND DISEASES.

CELOSIA (Amarantaceæ).—Half-hardy annuals. *Soil:* Loam, leaf mould and sand, treated with a little artificial fertilizer. *Increase:* Sow in heat in April, pricking off the seedlings into a well-drained soil. These plants should be watered carefully, as they are very subject to damping off. The flowers appear in July and August and are red and yellow.

CELSIA, *Arcturus* (Scrophulariaceæ).—Biennials, with tall, bright yellow flowers, in form somewhat like the verbascums. *Soil:* Any ordinary good soil is suitable. *Increase:* By seeds sown in the cool greenhouse in autumn or spring.

CELTIS (Urticaceæ).—Deciduous trees, with bright yellow foliage in autumn. Soil: Ordinary, but preferably chalky. *Increase:* By seed.

CEMENT.—Cement is excellent for the construction of lily ponds and for pathways. Coloured materials can now be obtained which, when mixed with the cement, give it colour, very acceptable in shady

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

gardens. To make paths, etc., of concrete, sand should be mixed with the cement in the proportion of 1 of sand to 2 of cement, the mixture used in a semi-liquid condition.

CENTAUREA (Compositæ).—Hardy annuals and perennials, suitable for the mixed border and excellent for cutting. They will grow in any ordinary garden soil, in a sunny spot. Sow in autumn or spring. The perennial species can also be divided.

CENTRANTHUS, Valerian (Valerianaceæ). — Hardy annuals and perennials suitable for the border and rockery. *Soil:* Ordinary, limy or chalky, in a sunny position. *Increase:* By seeds or division.

CENTROPOGON (Campanulaceæ). — Stove and greenhouse perennials. *Soil:* Sandy peat and rich, fibrous loam. *Increase:* By division or cuttings.

CEPHALOTAXUS. — Hardy evergreen trees and shrubs. *Soil:* Ordinary, in a shady position. *Increase:* By seeds and cuttings.

CEPHALOTUS (Saxifragaceæ).—Greenhouse herbaceous perennial. *Soil:* Equal parts chopped sphagnum moss and peat, with a little sand. Position, in the shade. *Increase:* By division.

CERASTIUM (Caryophyllaceæ). — Hardy perennials, very suitable for carpet plants in the rock garden. They will grow almost like weeds in any soil. They will seed themselves, but the plants may be divided in autumn or spring if desired.

CERATOSTIGMA (Plumbaginaceæ).—Deciduous shrubs. *Soil:* Ordinary, well drained, in a sunny position. *Increase:* By root division or cuttings.

CERCIDIPHYLLUM (Trochodendraceæ).—Deciduous tree with ornamental foliage in autumn. *Soil:* Chalky, in a very sheltered position.

CERCIS (Leguminosæ). — Deciduous trees of easy cultivation. *Soil:* Moist, deep, sandy loam. Position, sunny. *Increase:* By seeds or grafting.

CERINTHE (Boraginaceæ). — Hardy annuals. *Soil:* Ordinary. Position, sunny border. *Increase:* By seeds sown in spring.

CHARDS.—The name given to growths which form on globe artichokes, after the main heads have been used and the plants cut back. When these new growths are 2 ft. high, they should be bound with straw and earthed-up for blanching. After about six weeks they will be ready for use.

CHARIEIS (Compositæ).—Cape Aster. A hardy annual with daisy-like flowers of white, blue, violet and crimson. All suitable for the rock garden. *Soil:* Ordinary. *Increase:* By seed sown under glass in March, or in the open ground in April.

CHEILANTHES (Filices).—Hardy and half-hardy ferns. For cultivation see Ferns.

CHEIRANTHUS, Wallflowers (Cruciferæ).—Hardy perennials, but generally treated as biennials. Easily raised from seed, or young plants can be purchased from any nurseryman. Sow in May or June in moist soil and when about three young leaves show, plant them out to 9 in. apart. Plant in the flowering position in October or November.

BEST TO GROW.—"Fire King," "Grenadier," "Crimson Monarch," "Vulcan," "Orange Prince," "Gold Reef," The "Siberian Wallflower," *C. Allionii*, is becoming more popular in rockeries and borders.

CHELONE (Scrophulariaceæ).—Excellent border plants, flowering in summer and autumn. *Soil:* Moist, sandy loam, with plenty of manure added. *Increase:* By seeds, cuttings or division.

CHENOPODIUM (Chenopodiaceæ). — Hardy annuals and perennials. The shoots of *C. Bonus-Henricus* are used as asparagus, and this species is also grown as a substitute for spinach. *Soil:* Ordinary. Position, sunny. *Increase:* By seeds.

CHERVIL.—*See* HERB GARDENS.

CHESTNUT, HORSE, *Aesculus* (Sapindaceæ).—Deciduous flowering trees. *Soil:* Deep, well drained, moist. *Increase:* By seed sown when it falls, covering it with its own depth of soil.

CHICORY, *Cichorium Intybus* (Compositæ).—Chicory has been grown for some time for mixing with coffee. When forced and blanched it also makes a very useful salad. *Soil:* Good, ordinary, previously well manured. Sow in drills 1 ft. apart, covering with ½ in. of soil. When the seedlings are about an inch high they should be thinned to 8 in. apart. Very little attention is necessary, except to keep down the weeds. In October or November the plants may be lifted, cleaned and stored in dry sand until they are to be forced. For blanching, the stored roots should be lifted into boxes of moist soil and stood in a dark airy shed, syringing the plants occasionally with tepid water. Blanching takes about 21 days.

CHIMONANTHUS (Calycanthaceæ).—Winter Sweet. Hardy deciduous shrubs, with exceptionally fragrant flowers in midwinter. *Soil:* Deep moist sandy loam under a south wall. Plant in October or March. *Increase:* By layers, seeds, or suckers. Prune in February, cutting away the weak shoots and shortening the stronger ones.

C. praecox, the "Wintersweet," is the finest of plants for the winter garden.

CHINA ASTER.—*See* ASTER, CHINA.

CHIONANTHUS (Oleaceæ). — Deciduous flowering shrubs. *Soil:* Moist loam, in a sunny position. *Increase:* By seeds, cuttings, and layers in September. The flowers of the species are white and are borne in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

June and July. The foliage of *C. virginica* turns to a bright yellow in autumn.

CHIONODOXA, Glory of the Snow (Liliaceæ).—Hardy bulbous plants bearing blue flowers. For cultivation *see* BULBS.

CHIVES, *Allium* (Liliaceæ).—Bulbous rooted perennial of the same genus as Leeks, Onions, etc. *Soil:* Ordinary. Plant in March, setting the bulbs 6 in. apart each way. Lift, divide and replant every third year.

CHLIDANTHUS (Amaryllidaceæ).—Half-hardy bulbous plants. *Soil:* Loam, leaf mould and peat, with a little sand. Lift at the approach of wet weather and store in dry sand or light soil. *Increase:* By offsets.

CHLOROPHYTUM (Liliaceæ).—Evergreen greenhouse plants with ornamental foliage. *Soil:* Rich porous loam. *Increase:* by seeds, division, or suckers.

CHOISYA (Rutaceæ). — Evergreen shrub suitable for hedges in mild districts. *Soil:* Ordinary. Position, sheltered. Plant in April or September. *Increase:* By cuttings taken from March to June.

CHORIZEMA (Leguminosæ).—Greenhouse evergreen flowering shrubs. *Soil:* Equal parts fibrous peat and loam with a little sand added. Prune after flowering. Minimum temperature 45°. During July to September the plants may be stood in the open. *Increase:* By seeds in spring or cuttings in summer.

CHRYSANTHEMUM (Compositæ). — Greenhouse and hardy annuals, perennials and shrubs. *Soil:* Ordinary, good rich loam.

BEST TO GROW.—*C. carinatum*, a tri-colour variety with distinct bands of red or crimson, orange or yellow, and white; annual. *C. coronarium*, shades of yellow and white; these are generally grown as pot plants; sow in Feb. or March; height 1 ft. *C. inodorum*, "Bridal Robe," white, 3-4 ft., annual, sow where to flower. *C. maximum*, large-flowered, white, "ox-eye" daisies, hardy perennial. *C. leucanthemum* and *C. uliginosum* are very similar. Some of the best varieties of *C. maximum* are: "A. J. Church," " Curly Head" (incurved petals), "Mayfield Giant," "Mrs. Lothian Bell," "Kenneth" (fringed), "Marion Collier" (semi-double, fringed).

Japanese Chrysanthemums are best flowered in pots in the greenhouse. Plants can be purchased from any nurseryman after the end of January, or cuttings may be taken from older plants during the winter.

A compost of four parts loam, one part leaf mould and one part sand, with the addition of a little well-decayed manure and mortar rubble, and possibly a little wood ash, is used for potting. At all costs, frost must be excluded. From the small pots, move them on gradually by easy stages into larger pots, but never shift them until the roots actually fill the pot.

BEST TO GROW.—*For outdoor cultivation (Doubles).*—"Mrs. W. D. Cartwright," rich yellow; "Pink Circle," pink; "Snowflake," pure white; "Crimson Circle," blood-red crimson; "Mrs. Jack Pearson," bronze; "Mrs. Phil Page," red; "Warrior," crimson with gold reverse; "Old Gold," golden orange; "Robin," scarlet chestnut.

Singles.—"Canada," salmon rose; "Golden Gleam," rich orange; "John Woolman," rose-pink, white zone; "Mary McAlpine," creamy white; "September Gem," yellow; "Stanley Baldwin," wine.

Decorative Chrysanthemums.—"Arabella," silvery rose; "Aurora," orange-bronze; "Balcombe Bronze," bronze, with gold-tipped petals; "Bianca," terra-cotta, golden reverse; "Friendly Rival," deep yellow; "Gladys Pierson," golden buff; "Kenneth Hastie," crimson-maroon; "Sungold," gold-chestnut.

Incurves (petals curving inwards).—"Aloma," yellow; "Joan Higgs," pure white; "Progress," silvery mauve.

Singles.—" Brilliance," scarlet; "Chastity," creamy white; "Daphne," silvery pink; "Desert Song," tawny yellow; "Futurity," pale salmon; "Mrs. H. Woolman," orange-yellow; "Nona," velvety purple; "Splendour," chestnut flushed red; "Valerie," terra-cotta.

Anemone-centred singles.—"Aphrodite," mauve pink; "Captivation," golden brown, yellow cushion; "Golden Nymph," straw-yellow, golden cushion; "Heloise," salmon; "Wendy," amaranth; "Winsome," crimson.

Pom-poms. — "Baby," deep yellow; "Bright Eyes," bluish-white outer petals, orange apricot reverse; "Button Rose," rose; "Buena," golden-bronze; "Padoka," light salmon; "Snowball," pure white.

Chrysanthemum, Cascade.—Varieties of small-flowered chrysanthemums so grown that they produce the effect of a floral cascade, reaching from the top shelves of the greenhouse to the floor. They can be grown from seed which comes true to type, or young plants can be purchased at the beginning of the year. The cascade effect is produced by the method of cultivation. While the plants are young the central stem is tied to a stake placed at an angle of 45° in the pot, pointing towards the north. By constant pinching an enormous number of side growths are induced to develop, and when almost at the flowering stage the plants are untied from the stake, the pots turned round and the main stem allowed to droop.

CHRYSOGONUM (Compositæ).—Hardy herbaceous perennial, useful for the rockery. *Soil:* Loam, peat and leaf mould

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in equal proportions. Position, shady. *Increase:* By seeds or division in March or September. The flowers are golden-yellow, appear in May and June. They reach a height of 9-12 in.

CHRYSOPHYLLUM (Sapotaceæ). — Stove evergreen trees. *Soil:* Well drained peat and loam. *Increase:* By cuttings.

CICHORIUM ENDIVIA.—*See* ENDIVE.

CIMICIFUGA (Ranunculaceæ).—Hardy herbaceous perennials. *Soil:* Ordinary. Position, moist, shady border. *Increase:* By seeds or root division in spring.

CINCHONA (Rubiaceæ).—Stove evergreen trees and shrubs valuable for quinine, which is extracted from the bark. *Soil:* Fibrous loam, peat and coarse sand. *Increase:* By cuttings of ripened wood. All the species have fragrant, white or pink flowers, and grow to a height of 15-40 ft.

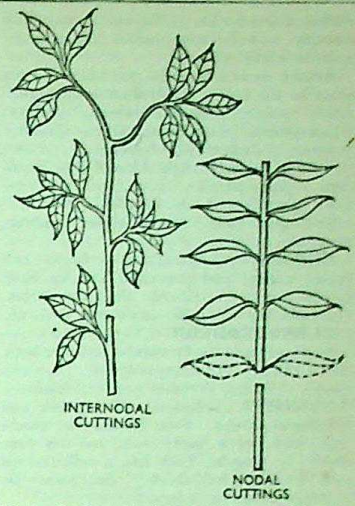
CINERARIA (Compositæ). — Correct name Senecio. Greenhouse annuals and perennials, sometimes used for summer bedding. *Soil:* Fibrous turf, leaf mould and charcoal. Sown in May or June, these plants will flower from February to March, and probably from November to May. The seed should be sown thinly in pans of specially prepared soil in mild heat, in semi-darkness, but when the seedlings appear they may be brought into the light. When the plants are well established, weak doses of liquid manure will be appreciated. The annual species may be sown in March for winter blooms, or in July for spring flowers. The soil for annuals should consist of loam, peat, leaf mould and sand, with a little complete fertilizer added.

CINNAMOMUM (Laurineæ). — Greenhouse trees with decorative and fragrant foliage and greenish-white flowers. *C. camphora* is the plant from which the camphor of commerce is obtained. *C. zeylanicum* is the tree of Ceylon which is called "Cinnamon Tree."

CISTUS, Rock Rose (Cistaceæ).—Hardy and half-hardy shrubs. *Soil:* Light and dry, in a sunny, sheltered position. Heavy soils should be lightened by the addition of peat and leaf mould. *Increase:* By seeds sown in April, or by cuttings taken in August.

CITRUS (Rutaceæ).—Greenhouse evergreen flowering shrubs with ornamental fruits. *Soil:* Two parts turfy loam, one part leaf mould, one part dry cow manure, with sand, charcoal and bonemeal. Position, cool greenhouse. Minimum temperature, 45°. *Increase:* By cutting, grafting, or layering.

BEST TO GROW.—*C. aurantium*, the ordinary "Sweet Orange." Many other species of citrus may be grown in the greenhouse for the sake of ornamental fruits.



Most shrubs are increased by nodal cuttings—a cut below a joint—but some, including the clematis and willow, by means of internodal cuttings

CLADRASTIS (Leguminosæ). — Deciduous trees with yellow and white pea-shaped flowers. *Soil:* Good loam, sunny position. *Increase:* By seeds or root cuttings.

CLARKIA (Onagraceæ).—Hardy annuals, very decorative in the mixed border or greenhouse, or the dwarf varieties can be used for edging. Any ordinary soil suits these plants. Sow in autumn or spring in the position in which they are to flower. Seed may be sown in pots in the autumn and wintered in the cold frame, when they will flower in April and May in the greenhouse.

CLEMATIS (Ranunculaceæ). — Hardy shrubs and climbers. Some of the species are useful for growing on a north wall, where they are fairly successful. *Soil:* Open loam with lime. Clematis grow wild in chalky districts, and appreciate plenty of lime in the soil. Plants are generally purchased in pots and can therefore be planted at any time, except when the soil is frosty.

Pruning.—Each type of clematis requires slightly different treatment in the matter of pruning. But for the novice it is sufficient to distinguish between the late-flowering and early-flowering kinds. Those that flower late generally produce their flowers on new wood, and can therefore be cut back to within a few inches of the base, or, in the case of older plants, to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

within a few inches of the old stems. This pruning will be done before the summer growth commences.

Among named hybrids, the following are some of the best: "Lady Londesborough," silver grey; "Miss Bateman," white; "Lasurstern," deep blue; "Gypsy Queen," purple; "Jackmanii Superba," violet; "Perle d'Azure," bright blue; "The President," plum purple; "Blue Gem"; "Crimson King"; "Lady Caroline Neville," white, pink bar; "Nellie Moser," silver, pink bar.

CLEOME (Capparidaceæ).—Stove and hardy annual and perennial shrubs. *Soil:* Light, rich, well drained. Position, sunny. *Increase:* By cuttings, seeds and division.

CLERODENDRON (Verbenaceæ). — Greenhouse and hardy shrubs and climbers. *Soil:* Ordinary, in a sunny position. *Increase:* Seeds, cuttings, division and root suckers.

CLETHRA (Ericaceæ).—Evergreen and deciduous shrubs. *Soil:* Loam, leaf mould and sand, or a peaty soil, but no lime should be present. They like a well-drained soil in the half-shade. *Increase:* By cuttings taken in August.

CLIANTHUS (Leguminosæ). — Semi-evergreen shrubs, rather tender in Britain and should be grown on an east or west wall. *Soil:* Well-manured loam. *Increase:* By seeds and cuttings.

CLICK BEETLE, Wireworm. — *See* PESTS AND DISEASES.

CLIMBING PLANTS.—The true climbing plants are those which fix themselves to supports by the aerial roots, as in the case of ivy, by adhesive pads, as in the case of Virginian creeper, or by twining tendrils, leaf-stalks, main stems, prickles or thorns, as in the case of such plants as sweet peas, nasturtiums and rambler roses. The gardener may include with these any shrubs that succeed best when trained on to a wall or fence, e.g. scarlet cydonia.

The type of support needed for a climbing plant depends on the method by which it climbs, and some are more suitable for growing against walls and close-boarded fences, while others succeed best where they are allowed to ramble over old trees, evergreen shrubs and similar supports.

Planting Hints.—When any climbing plant is to be planted, remember that it cannot be moved when once it is established, and it is therefore very important to see that the soil is dug to a depth of at least 2 ft., and that it is enriched with manure or bonemeal.

Another point to notice is the natural water supply of the site. Often climbers are planted against house-walls, where the eaves prevent rain from reaching the roots. To counteract this, as much moisture-holding charge as possible should be dug into the ground before planting. Well-decayed manure, leaves or spent hops, or the contents of a compost pit will all be useful. Plant firmly and tie the climber to a support.

The climbers most suitable for the various different positions are indicated in the following lists:

Annual climbers for new gardens.—*Humulus japonicus* (Hops); Canary Creeper; Nasturtiums; Convolvulus; Sweet Peas; *Cobœa scandens; Curcurbita* (Gourds); *Ipomœa*; *Eccremocarpus.*

Perennial climbers for permanent planting.—Self-clinging, for brick or stone walls: *Ampelopsis Veitchii*; *Hedera* (Ivy); *Vitis Henryana.*

Climbers for sunless walls.—Morello Cherry; Ivy; *Ampelopsis Veitchii*; *Polygonum baldschuanicum*; Rose "Félicité-et-Perpétué"; Rose "Mermaid."

Climbers for porches that make a smother growth.—*Humulus* (Hops); *Clematis montana*; Jasmines; Honeysuckle; Rose "Alberic Barbier"; Ivy.

Climbers for Pergolas and Verandas.—Roses, Jasmines, Wistaria, Bougainvillea, Clematis, Vines, *Passiflora, Forsythia.*

CLINTONIA (Liliaceæ).—Hardy herbaceous perennials, suitable for the damp, shady border or rockery, or the bog garden. *Soil:* Sandy peat. *Increase:* By division in spring.

CLITORIA (Leguminosæ).—Stove evergreen climbers with blue or pink pea-shaped flowers. *Soil:* Fibrous loam, peat, sand and a little charcoal. Minimum temperature, 50°. *Increase:* By cuttings or seeds.

CLIVIA, Caffre Lily (Amaryllidaceæ).—Greenhouse evergreen tuberous-rooted plants. *Soil:* Two-thirds loam, one-third decayed manure and sand. Pot in February. *Increase:* By seeds or by division of suckers. Minimum temperature, 40°.

BEST TO GROW.—*C. cyrtanthiflora.* A hybrid which has salmon-pink flowers with white centres and greenish tips.

CLOCHE.—A tent-shaped glass cover which can be set over alpines or any other plants, to protect them from excessive rains, frost, etc. Where rows of plants are to be protected, pieces of glass clipped together with special wire clips are used to form a continuous tent.

CLOSE ATMOSPHERE.—The air in a cold frame when the lights are kept closed becomes moist and humid, and plants in this atmosphere lose less water by evaporation A similar condition is obtained when the plants are covered by cloches in the open or in the greenhouse. A close atmosphere assists the quick recovery of transplanted plants and also the rooting of cuttings, but if the atmosphere is kept close

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for too long a period, damping-off may result.

CLOVER.—*See* TRIFOLIUM.

CLUMP.—The term given to a large root of such herbaceous plants as Michaelmas daisies. A large clump will not produce such good flowers as a group of smaller plants, and all clumps should be divided from time to time. One of the easiest ways to do this is to push two handforks into the centre of the clump back to back, and then lever them apart.

CNEORUM (Simarubaceæ).—Evergreen shrubs mostly suitable for the greenhouse. *Soil:* Sandy loam and peat, rather dry. *Increase:* By cuttings in April. For outdoor cultivation *C. tricoccum* should be grown. This has yellow flowers in June, followed by red fruits. Grows usually only a foot or two high, though it will sometimes reach 6 ft. It needs wall protection.

CNICUS (Compositæ). — Biennials and perennials of thistle-like habit. *Soil:* Ordinary, rather warm. *Increase:* By seeds sown under glass in February, or in the open in April.

COAL-ASH.—Sifted very finely, coal-ash is useful to lighten clay soils. Unburnt coal is, however, a source of danger, and coal-ash is generally only recommended for path-making.

COBÆA (Polemoniaceæ). — Half-hardy evergreen climbers. For summer use outdoors; treat them as annuals. *Soil:* Fairly rich, and not too heavy. At the same time the soil should not be too rich, otherwise the plants make foliage at the expense of flowers. Position, in full sun.

COCCULUS (Menispermaceæ).—Tender evergreen shrubs and climbers. *Soil:* Ordinary. *Increase:* By root division of cuttings.

CODIÆUM (Euphorbiaceæ). — Stove evergreen shrubs. *Soil:* Four parts loam, two parts turfy peat, one part sand. Repot in March. Minimum temperature, 60°. *Increase:* By cuttings from the ends of shoots. All the species and varieties have ornamental foliage.

CODLING MOTH.—The Apple Maggot. *See* PESTS AND DISEASES.

CŒLOGYNE.—Terrestrial orchids suitable for warm house. For cultivation *see* ORCHIDS.

COFFEE TREE (Rubiaceæ). — Stove evergreen shrub which bears the coffee bean of commerce. *Soil:* Two parts turfy loam, one part leaf mould and some sand. Pot in March. Minimum temperature, 60°. *Increase:* By seeds or cuttings.

COIX.—An ornamental grass known as "Job's Tears." *See* GRASSES.

COLCHICUM (Liliaceæ).—Hardy bulbs suitable for naturalizing in lawns or shrubberies. *Soil:* Ordinary. Plant the bulbs 3 in. apart and 6 in. deep as soon as obtainable in summer. *Increase:* By seed sown outdoors in August or September, or in the cold frame. Plants will not flower until they are four or five years old.

COLEUS (Labiatæ).—Greenhouse perennial. *Soil:* Four parts loam, two parts leaf mould, one part sand. Pot in early spring. Minimum temperature; 50°. *Increase:* By cuttings.

COLLETIA (Rhamnaceæ).—Stove evergreen shrubs. *Soil:* Sandy loam. *Increase:* By cuttings. These shrubs have no special floral attraction but have interesting spines.

COLLINSIA (Scrophulariaceæ).—Hardy annuals with small, snapdragon-like flowers. *Soil:* Ordinary. Sow in March or April, or in a sheltered position in autumn. Thin out to 6 in. apart, or transplant to that distance.

COLOCASIA (Aroideæ).—Stove tuberous perennials with ornamental foliage. Allied to the caladiums. *Soil:* Equal parts turfy loam, peat and silver sand, in the shady plant stove. Pot in February. *Increase:* By division of the tubers at potting time.

COLUMBINE, *Aquilegia* (Ranunculaceæ).—Popular hardy herbaceous plants, flowering for a long period from May onwards. *Soil:* Ordinary. Position, sunny or semi-shady. *Increase:* By seeds or, if preferred, by division in April or September.

BEST TO GROW.—*A. alpina* for the rock garden, a dwarf species, blue, needs light warm soil. *A. cærulea* and its numerous named hybrids; one of the finest recently introduced is "Crimson Star," in which the outer petals are bright crimson and the inner ones cream.

COLUTEA (Leguminoseæ).—Deciduous flowering shrubs known as "Bladder Senna." Easily cultivated and suitable for towns. *Soil:* Ordinary. *Increase:* By seeds or cuttings.

COMMELINA (Commelinaceæ).—Greenhouse and hardy annuals and perennials, the fleshy roots of which are edible when cooked. *Soil:* Light rich. Sow the hardy species in spring. Lift the tubers at the approach of frost and store like dahlias. *Increase:* By seeds, and the perennials also by division or cuttings.

COMPARETTIA. — Stove epiphytal orchids. For cultivation *see* ORCHIDS.

COMPOST. — Any mixture of soil specially made up for use in potting, etc., is called a compost.

COMPOST PIT.—A deep hole dug in a corner of the garden that is screened from view, should be from time to time filled with garden refuse such as leaves, annual weeds, tops of herbaceous perennials, and rubbish from the vegetable plot. All household refuse, such as parings, bones, scraps of old cloth, etc., can also be thrown into

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the pit. A dusting of lime, and an occasional light covering of soil added to this matter will in the course of a few months cause it to become valuable manure, to add to light soils to retain moisture or to heavy soils to improve the texture.

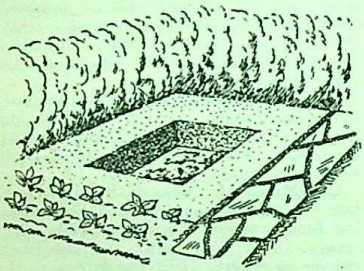
CONCRETE.—*See* CEMENT.

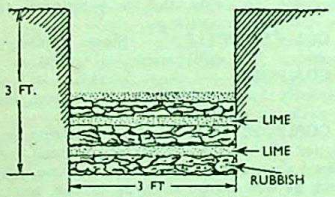
CONE FLOWER, Rudbeckia (Compositæ).—Hardy annuals and perennials with raised centres and dropping rayed florets to the flowers. Suitable for the mixed border and useful for cutting. *Soil:* Ordinary, with plenty of moisture. *Increase:* By seeds sown under glass in spring. Perennials by division of roots.

CONIFERS. — These are the cone-bearing trees belonging to the natural order Coniferæ. The most commonly grown of these are the Pines (*Pinus*), Larches (*Larix*), Spruce (*Picea*), Junipers (*Juniperus*), Arbor Vitæ (*Thuja*) and Cedars (*Cedrus*). The majority are evergreen, and all are extremely decorative and form one of the most useful groups of plants to the landscape architect. They are particularly useful for large estates on account of their value as timber.

Most conifers will grow in any soil, with the exception of very thin chalky soil or barren peat, so long as the soil is not waterlogged. Two feet of good soil above chalk will suffice for the cultivation of good specimens.

Planting should be done while the trees



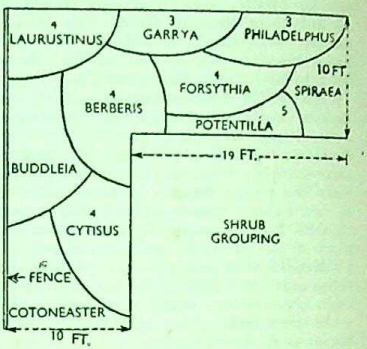


COMPOST PIT

Compost pit, if situated in the far corner of the garden, can be screened by peas and beans, and is a real asset to the garden

are still very small for the best results. Thoroughly dig the site first, and only plant when the weather is showery and the soil warm—April or September for preference.

Some conifers are apt to be damaged by frosts, and for these some sort of shelter planting, either some of the hardier



Select evergreen shrubs to plant against boundary fences and allow about one shrub per square yard. Closer planting may be necessary for immediate effect, but some of them should be moved after a few years

conifers or other forest trees, should be grown on the east side of the tender species.

A complete list and full description of the valuable species and varieties that could be grown would fill volumes. The one given here may be taken as a brief guide by those who wish to select for small gardens. For specimen trees, the ones stated to be pyramidal in habit are recommended. None of the conifers needs pruning, except rarely to remove dead branches, or any that are broken in the gales.

Cedrus atlantica, lawn specimen; *Cupressus Fletcheri*, pyramidal growth; *Cupressus Lawsoniana*, suitable for hedges; *Juniperus communis*, common Juniper; *Larix europœa*, common Larch; *Picea Abies*, Norway Spruce; *Pinus insignis*, hardy by the sea; *Pinus austriaca*, for shelter belts; *Sequoia gigantea*, Wellingtonia; *Taxus baccata*, English yew; *Thuya Lobbii*, for screens and hedges.

CONVALLARIA, Lily - of - the - valley (Liliaceæ).—Hardy herbaceous perennials, suitable for positions where they can be left undisturbed. They like to roam alongside a stone wall or path. Plant in autumn. *Soil:* Ordinary, outdoors. For pot culture use one part fibrous loam, one part leaf mould, and some sharp sand. Pot up 8-12 crowns in a 48 pot in October or November. Bring into greenhouse from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the cold frame in January. For forcing, pot them up separately, and when the flowers begin to show, remove to a temperature of 75-80°. *Increase:* By root division.

CONVOLVULUS (Convolvulaceæ). — Hardy annuals, perennials and shrubs. *Soil:* Ordinary, in a warm situation. Rich soil encourages luxuriant growth in the climbing varieties, which are those most commonly grown. *Increase:* By seed sown under glass in spring, or in the open later.

COOPERIA (Amaryllidaceæ). — Half-hardy bulbs, opening their flowers in the cool of the evening. *Soil:* Equal parts loam, peat and leaf mould. Pot in January or February. Minimum temperature, 40°. Can be grown outdoors in a warm border of sandy soil. *Increase:* By seeds or offsets.

CORDON.—Trees trained so that they have only a single stem with short spurs all along it, from which the flowers and fruits develop, are called cordons. They are useful when fruit is grown in small gardens.

CORDYLINE, New Zealand Cabbage Tree, *Dracæna* (Liliaceæ).—Fairly hardy in warm soil, and useful for giving a tropical effect to the garden. *Increase:* By suckers or seeds. The tops of tall, leggy specimens will root in coconut fibre in a propagating case.

COREOPSIS (Compositæ). — Hardy annuals and perennials. The annuals are generally called by seedsmen "Calliopsis" (*which see*). *Soil* for perennials: Ordinary, with plenty of water. *Increase:* By seeds, young plants being more satisfactory than older ones. Best to treat them as biennials.

CORIANDRUM (Umbelliferæ).—Hardy annual, the leaves of which can be used in the salad bowl or for flavouring soups. The seeds are used by confectioners. *Soil:* Ordinary, full sun. *Increase:* By seeds sown in drills 1 ft. apart, in autumn or spring.

CORK OAK, *Quercus suber.*—*See* OAK.

CORM.—A fleshy rootstock, at first appearing similar to a bulb. On investigation it will be found to be more solid. It is an underground stem bearing one terminal bud. The food is stored in the swollen stem.

CORNFLOWER.—*See* CENTAUREA.

CORN SALAD, *Valerianella olitoria.*—A useful salad plant. Sow in autumn, broadcast over rich soil. Can be sown amongst a crop of winter onions. The whole plant is pulled up when the leaves are required for use in winter or spring.

CORNUS, Dogwood (Cornaceæ).—Useful shrubs, mostly deciduous, with white flowers and ornamental berries. *Soil:* Ordinary. Pruning consists in thinning after flowering. *Increase:* By seeds, layering or suckers.

CORONILLA (Leguminosæ). — Hardy and half-hardy shrubs. Mostly with yellow pea-shaped flowers. *Soil:* Ordinary, in a hot, dry, sunny position. *Increase:* By seeds or cuttings.

CORREA (Rutaceæ).—Evergreen shrubs with tubular, fuchsia-like flowers. Need greenhouse treatment. *Soil:* Peat and leaf mould with loam and sand. *Increase:* By cuttings or grafting.

CORTADERIA.—*See* PAMPAS GRASS.

CORYDALIS, Fumitory (Papaveraceæ).—Annuals and perennials, with fernlike foliage. *Soil:* Ordinary. Shade suits many of the species. *Increase:* By seeds or division.

CORYLOPSIS (Hamamelidaceæ). — Deciduous flowering shrubs. Hardy, with yellow flowers, usually appearing in March and April before the leaves, and sweetly scented. *Soil:* Ordinary, rich. No pruning required. *Increase:* By layers.

CORYLUS.—*See* NUTS.

COSMOS (Compositæ).—Annuals and perennials suitable for border decoration. *Soil:* Ordinary. Position, sunny. *Increase:* By seeds sown under glass in spring. Keep the plants in their pots until they are almost starved before planting out. This will induce earlier blooming.

COTONEASTER (Rosaceæ). — Deciduous and evergreen shrubs, berry-bearing. *Soil:* Ordinary. *Increase:* By cuttings. These root readily in the open in July, or under glass.

BEST TO GROW.—*C. frigida,* 15-20 ft., with large clusters of berries persisting until February, useful for towns, erect. *C. horizontalis,* 2-3 ft., of graceful horizontal habit; berries red, very numerous, along every stem; these are useful for rock gardens.

COTULA (Compositæ). — Carpeting plants with small, fernlike leaves. Height, 1-3 in. *Soil:* Any gritty loam, such as in the cracks of paving or the pockets of the rock garden. *Increase:* By seeds which sow themselves.

COTYLEDON (Crassulaceæ). — Succulent or semi-succulent plants suitable for the rock garden. *Soil:* Ordinary. *Increase:* By cuttings. There are many species, some known under the name of Echeveria, and some suitable only for greenhouse cultivation.

CRAB APPLES.—Various species of the genus Malus, grown as ornamental trees. One of the most decorative, which also provides fruits suitable for preserves, is the hybrid "John Downie."

CRAMBE MARITIMA.—*See* SEAKALE.

CRASSULA (Crassulaceæ).—Greenhouse annuals, biennials and perennials. Sow in pots in early spring, or take cuttings from the perennials of shoots 2 or 3 in. long, choosing shoots that have not flowered. In spring stop the plants 3 or 4 in. from the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pot, and take off a few of the top leaves. This encourages the formation of more shoots. When the shoots are 2 in. long, move the plants into larger pots, filled with loam and broken brick. Plunge them outdoors in shelter in summer, moving them to a cold pit at the approach of frost. The plants so treated will be ready for bedding-out at the end of May.

CRATÆGO-MESPILUS (Rosaceæ). — Interesting trees that are hybrids, natural and graft, between the hawthorn and the medlar. Cultivation as for hawthorns (Cratægus).

CRATÆGUS, Thorns (Rosaceæ). — Ornamental deciduous trees with berries of varying sizes, all very decorative. *Soil:* Ordinary, with lime. Plant when the leaves are absent. *Increase:* By seeds, which are slow in germination.

CRAZY PAVING.—*See* PATHWAYS.

CREEPING JENNY, *Lysimachia nummularia* (Primulaceæ).—A prostrate creeping evergreen plant with yellow flowers, that will grow in sun or shade. It is suitable for window-boxes and tubs, for the rock garden or the wild corner. *Soil:* For pots, two parts loam, one part leaf mould and a little sand. *Increase:* By division.

CREPIS, Hawkweed (Compositæ).—*C. rubra* is an annual which deserves popularity. Sow in autumn or spring. Red or pink flowers, like a dandelion but with drooping petals. 6-9 in.

CRESS, GARDEN, *Lepidum sativum* (Cruciferæ).—Grown to associate with mustard in the salad bowl. Sow thickly on soil, or on hessian or flannel. Shade from light, and keep moist until germination has taken place. If well watered at the time of sowing, no more water should be needed until it is time to cut.

CRESS, LAND, *Barbarea præcox* (Cruciferæ).—A plant with hard and pungent leaves, but useful for salad and for garnishing in winter. Sow in any soil, but preferably a moist border in autumn.

CRESS, WATER, *Nasturtium officinale.*—A hardy aquatic with white flowers. Can be cultivated in gardens in moist soil, being easily raised from seeds sown *in situ.*

CRINUM. — Stove and greenhouse bulbous plants. *Soil:* Four parts loam, two parts leaf mould, one part sand. Pot in spring. *Increase:* By seed, which takes several years to flower, or by offsets at potting time.

CROCOSMIA (Iridaceæ).—Almost hardy bulbs. *Soil:* Light, with leaf mould and sand. *Increase:* By seeds or offsets. For pot culture plant six bulbs 1 in. deep in a 5-in pot.

CROCUS (Iridaceæ). — Hardy bulbs, suitable for any outdoor position. If grown for house decoration, they must be kept quite cool until the flowers open. Plant in autumn. *Increase:* By offsets, but crocuses are best left undisturbed as long as possible. Most commonly cultivated species, *C. vernus, C. versicolor, C. aureus.*

Autumn-flowering varieties are treated in the same way as the better-known spring crocus, except that they are planted not later than September.

CROWN IMPERIALS, *Fritillaria imperialis* (Liliaceæ).—Tall, imposing flowers on 3-4 ft. stems, which succeed admirably in narrow borders along house walls. The flowers appear below a tuft of green. *Soil:* Ordinary, deep rich. In pots: Equal parts loam, peat, leaf mould, decayed manure and sand. Plant in October. *Increase:* From seed, which is slow to reach maturity. Or by division when the plants produce two flower stems.

CRYPTOGRAMME. — Parsley Fern, suitable for cool rockeries, with loam and peat but no lime. *See also* FERNS.

CRYPTOMERIA.—*See* CONIFERS.

CUCUMBER, *Cucumis sativus.*—Suitable for culture in frames and greenhouses. The ridge varieties can be grown outdoors. *Soil:* Equal parts good turfy loam, roughly broken, and well-rotted strawy manure, with a potful of old soot and one of bone-meal to each bushel. Grown in beds or in mounds of soil on stages in the greenhouse, half a barrowload to each plant. Sow in pots, potting on as required, and setting the seedlings in the soil up to the bottom leaves. Train to grow on canes and wires.

Ridge cucumbers are generally grown on mounds. They need sufficient supplies of organic matter and plenty of water. Plant them in the open in June. Or sow seeds direct in the open in May.

CUCUMBER COLLAR ROT. — A fungous disease, probably introduced through the medium of leaf mould used for the cultivation of the crop. Treat the soil with kainit where this is troublesome. Water the soil, immediately the disease shows, with sulphate of potash.

CUCUMIS.—*See* CUCUMBER. Melons also belong to this genus.

CUCURBITA. — *See* VEGETABLE MARROW, GOURDS, PUMPKINS.

CUDRANIA (Urticaceæ). — Deciduous hardy trees. Flowers insignificant. The leaves are used by the Chinese for feeding silkworms when mulberry leaves are unobtainable. 20 ft. Soil: Ordinary. Plant when the leaves are absent.

CUPHEA, Mexican Cigar Flower (Lythraceæ). — Greenhouse evergreen plants, also useful for outdoor beds in summer. *Soil:* Dry rich. Minimum temperature, 50°. Pot in March or April, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

plant outdoors in June. *Increase:* By seeds, or by cuttings in spring or August.

CUPRESSUS.—*See* CONIFERS.

CURRANTS, BLACK. — *See* FRUIT AND ITS CULTURE.

CUT FLOWERS ALL THE YEAR.—By careful selection of flowers and shrubs there should be no difficulty in providing flowers and foliage for indoor decoration all the year round, even from a small garden.

A short list of decorative material which can be easily grown is given here under the different months:

January: Chimonanthus præcox, Hamamelis mollis. Ivy, Winter Heliotrope, Sea Buckthorn (berries), Snowberry (berries), Christmas Roses, Winter Honeysuckle, Winter Aconite.

February: Cyclamen coum, Erica carnea, Daphne Mezereum, Daphne collina, Garrya elliptica, Cornus mas, Primroses, Violets.

March: Allium, Crocus, Forsythia, Pansies (a few), Snowdrops, Almond Blossom, *Iris stylosa.*

April: Bird Cherry, Broom, Anemones, Siberian Wallflower, Daffodils, Doronicum, Wallflowers, Primroses, Flowering Currants, Tulips, Berberis, Hyacinths.

May: Columbines, Double Arabis, Berberis, Deutzia, Dielytra, Peonies, Pinks, Honesty, Pyrethrums, Gypsophila, Lupins. Lilacs, Iris.

June: Asparagus, Campanulas, Cornflowers, Delphiniums, Erigeron, Guelder Rose, Heuchera, Iceland Poppies, Jasmine, Stocks, Oriental Poppies, Lilies.

July: Antirrhinum, Asters, Campanulas, Catmint, Calliopsis, *Chrysanthemum maximum,* Grasses, Lilies, Marigolds, Sweet Peas, *Veronica Traversii,* Carnations, Roses.

August: Ceanothus, Cornflowers, Dahlias. Escallonia, Larkspurs, Leycesteria, Nigella, Olearia, Phlox, Poppies, Montbretia, Solidago, Sea Holly, Carnations, Gladioli.

September: Chrysanthemums, Gladioli, Godetias, Red Hot Pokers, Sunflowers, Roses, Nasturtiums, Scabious, Rudbeckia, Physais, Mountain Ash, Sweet Sultan, Cosmos.

October: Asters, Chrysanthemums, Cornflowers, Dahlias, Everlasting Flowers, Gorse, Heather, Heleniums, Marigolds. Michaelmas Daisies, Beech leaves.

November: Autumn Crocuses, Chrysanthemums, Gorse, Heather, Solanum, Marigolds, all kinds of berries, rose hips, etc.

December: Winter Jasmine, *Chimonanthus præcox,* Iris, *Cotoneaster frigida* (berries), Sea Buckthorn (berries), Holly, Ivy, and (in the house) bulbs in bowls and pots.

CYANANTHUS (Campanulaceæ). — Hardy herbaceous plants. Suitable for the rock garden. *Soil:* Sandy, moist, protected from excessive rains. *Increase:* By seeds or cuttings.

CYANELLA (Liliaceæ). — Half-hardy bulbous plants. *Soil:* Two parts sandy soil, one part leaf mould or decayed cow manure. Plant in October. Cover with coconut fibre refuse until growth begins. *Increase:* By offsets in November.

CYCLAMEN (Primulaceæ).—Hardy and tender plants suitable for the open border, the rock garden or the greenhouse.

Outdoor Culture.—Plant in turf under trees, or in pockets of the rockery, and top dress annually after the flowers die down with heavy manure and rich soil.

Greenhouse Culture.—Sow seeds of *Cyclamen persicum* in August, in boxes of open soil. Lime should be added to the compost. Pot on as required, growing in gentle heat during the winter. Feed when the plants are coming into flower. The final potting soil should be of turfy loam, with well-rotted cow manure, crushed mortar, sharp sand and some peat moss.

CYCNOCHES.—Stove orchids, known as Swan Neck Orchids. For general cultivation *see* ORCHIDS.

CYDONIA, Quince (Rosaceæ). — Deciduous early-flowering shrubs, chiefly grown for their ornamental value, though the fruits are useful for preserves. *Soil:* Ordinary. Plant in November, and prune by cutting out old and unwanted wood in June. *Increase:* By seed, layers, suckers or cuttings.

CYMBIDIUM.—Greenhouse terrestrial orchids. *See* ORCHIDS.

CYNARA.—*See* ARTICHOKE *and* CARDOON.

CYNOGLOSSUM, Hound's Tongue (Boraginaceæ).—Hardy alpines and perennials for the border. *Soil:* Ordinary, or well-drained loam with leaf mould and sand. *Increase:* By division or seeds.

CYNORCHIS.—Stove terrestrial orchids. For cultivation *see* ORCHIDS.

CYPELLA (Iridaceæ). — Half-hardy bulbs suitable for the greenhouse or for a sunny, well-drained border. *Soil:* Ordinary. Plant outdoors from September to January, 4 in. deep and 2 in. apart. In pots, use sandy loam with leaf mould or peat, and decayed cow manure. Cover with coconut fibre until growth begins. Temperature never as low as freezing point. *Increase:* By offsets.

CYPERUS, Umbrella Plant (Cyperaceæ). —Ornamental sedges for the greenhouse or margins of lakes. *Soil:* Heavy loam with rotted cow manure, outdoors. Fibrous loam, leaf mould and sand under glass. *Increase:* By seeds or division.

CYPRESS, Cupressus.—*See* CONIFERS.

CYPRESS, SUMMER.—*See* KOCHIA.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CYTISUS, Brooms (Leguminosæ). — Popular, sun-loving shrubs, with numerous pea-shaped flowers. *Soil:* Ordinary. *Increase:* By seeds or grafting.

BEST TO GROW.—*C. albus*, White Portugal Broom, 7 ft. *C.* "Cornish Cream," creamy yellow flowers. *C. Osbornii*, canary-yellow. *C. scoparius*, Common Yellow Broom. *C.* "Donard Seedling," red, rose, yellow and white.

D

DABŒCIA (Ericaceæ). — Beautiful dwarf evergreen flowering shrubs. *Soil:* Either peat, lime-free soil or light, sandy loam with some leaf mould. Prune by removing all flower spikes in early spring. *Increase:* By seed, and the varieties by cuttings. Also by layering.

DAFFODIL.—*See* NARCISSUS.

DAHLIA.—An extensive genus of herbaceous half-hardy annuals and perennials, so well known as to scarcely need description. *Soil:* This must be well prepared, preferably in the autumn prior to planting. If deeply dug the soil will be aerated and broken up by the action of frost during the winter. Manure may be added, but this is not necessary unless show flowers are to be grown. Before planting decide the position of each plant according to its size and root run. Plant in May or June and sprinkle a little soot around each plant to keep off slugs that are fond of young plants. It is best to drive in stakes for the taller kinds before planting and then as the plants grow the shoots can be tied to the stakes. Seed pods should be taken off to encourage more flowers, and for exhibition flowers disbudding may be practised, but for ordinary purposes this is not necessary. Watering must be done in dry weather, and liquid manure or an artificial fertilizer will be of benefit. *Increase:* Once a stock of good varieties has been obtained these may be increased by cuttings taken in spring and grown on under glass until they are ready to plant. This method allows of stronger plants than would be obtained by planting out small cuttings. The plants may also be increased by dividing the tubers in spring before planting.

BEST TO GROW.—From a few species many varieties have been derived that bear little outward resemblance to each other, and are classified according to form.

Singles: Florets with edgings overlapping in one row. "Aurora," deep orange-red flowers. "Little Jennie," rosy-pink florets edged with palish mauve and shaded gold. *Mignons*, single flowers on dwarfish bushy plants. "Coltness Gem," crimson-scarlet. "Princess," pure white.

Pæony flowered, two or three rows of florets surrounding an open centre. "Emile," deep rich yellow flowers. "Tangerine," deep orange. "Lady Madden," a small pæony of pale primrose.

Decorative: Large double flowers with close centres, this class sub-divided into large, small and medium. "Grace Curling," pure white, ageing to rosy pink, large. "Nagel's Ideal," almost blue, medium. "Sonia," rich deep yellow, tinged red, small. *Cactus*, double flowers with high centres and long, narrow florets. "Edgar Jackson," pinkish-red. "The Arun," a striking novelty with salmon-pink flowers suffused with pale yellow and rose.

DAISY.—*See* BELLIS *and* CHRYSANTHEMUM.

DAISY, MICHAELMAS.—*See* MICHAELMAS DAISY.

DAPHNE (Thymeleaceæ).—Greenhouse and hardy evergreen and deciduous shrubs with fragrant flowers, in winter and spring. *Soil:* For greenhouse plants a mixture of equal parts of loam and sandy peat. Ordinary soil for outdoor plants or preferably sandy peat and leaf mould. *Increase:* By cuttings taken in autumn, and the trailing plants by layering.

BEST TO GROW.—*D. cneorum*, "Garland Flower," pink flowers in May, 1 ft., hardy. *D. Mezereum*, fragrant pink flowers before the leaves appear in February, followed by bright red berries; seed is the usual method of propagation since cuttings seldom succeed and layering is difficult; deciduous, 5 ft.

DAPHNIPHYLLUM (Euphorbiaceæ).—Evergreen flowering shrubs with large, rhododendron-like leaves, glaucous on under-surface. *Soil:* Chalky. *Increase:* By cuttings of unripe wood in summer.

DARLINGTONIA (Sarraceniaceæ). — Curious half-hardy plant. Leaves hood-shaped, hence the name Pitcher Plant. Its green, yellow and red flowers open in spring. May be grown out of doors in a sheltered garden. *Soil:* Moist, fibrous peat and sphagnum. *Increase:* By division when growth is commencing.

DARWINIA (Myrtaceæ).—Tender evergreen flowering shrubs. *Soil:* Loam, peat and sand in equal quantities. Prune in spring. *Increase:* By cuttings of young shoots inserted in sandy peat.

DATURA (Solanaceæ).—Half-hardy and greenhouse annuals and shrubs. If grown in tubs or pots they can be put out of doors in summer. The shrubs, often known as brugmansias, are trained on pillars, or grown in bush form. *Soil:* Light, sandy or ordinary for the annuals. Plant out in May. Loam and peat, with manure and silver sand for the other species. Pot in March and prune after flowering. Winter

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

temperature, 45°-55°. Summer temperature, 55°-65°. Water well in summer. Keep fairly dry in winter. Give liquid manure in summer. *Increase:* By seeds sown in heat, and the shrubs by cuttings. Almost all species have prickly fruits, and all are poisonous, yet are widely grown for their beauty.

DAUCUS.—*See* CARROTS.

DAVIDIA (Nyssaceæ).—Deciduous trees that are remarkable for the white bracts that accompany the flowers and account for their name of "Ghost Trees." Fruits like green plums. *Soil:* Deep loamy soil with plenty of moisture near the roots. *Increase:* Cuttings of side shoots.

DELPHINIUM (Ranunculaceæ). — Annual, biennial and perennial hardy plants that have been introduced from various quarters of the globe and range in colour through all shades of blue and violet to white. *Soil:* Ordinary soil will do for all species, but they like a deep, rich, loamy medium. The perennial species need soil that is further enriched with plenty of animal manure. The ground should be dug deeply in autumn and left rough to be broken up by frost. It should also be dressed with lime over the surface. Bone meal is a good substitute for animal manure where this is not obtainable. On heavy soil strawy manure helps to provide drainage, while on light soil heavier manure is better. Plant 2 ft. apart in February, and top dress with manure or leaves as soon as young shoots appear above the ground. Liquid manure given when the flower spikes are forming helps these to grow tall and imposing. The plants must never be allowed to dry out entirely. When set in their flowering quarters, they should be undisturbed for three years at least, so it is best to choose a sunny position before they are planted. The spikes should be thinned out to about seven, as if more are left to develop they will be only poor specimens. *Increase:* Sow seed for the annuals where they are to flower in April, or in boxes in March to plant out in May. The perennials are increased by seed sown out of doors in April, by cuttings of established plants in spring or autumn, or by division.

DESFONTAINEA (Loganiaceæ). — Dwarf hardy evergreen shrub suitable for use in the front of the shrubbery or for pot culture. Tubular flowers of yellow and scarlet, from July onwards. *Soil:* Peaty in partially-shaded position. *Increase:* By seeds or by cuttings under a bell-glass, over bottom heat.

DESMODIUM (Leguminosæ).—Greenhouse and hardy flowering shrubs and perennials. *Soil:* Light, well drained. For stove plants, two parts of loam, peat and sand. *Increase:* By seeds for all species, by cuttings for tender plants, and by division for the hardy species.

DEUTZIA (Saxifragaceæ).—Hardy deciduous flowering shrubs, of which some species bloom so early that they need to be planted close to other shrubs. *Soil:* Ordinary. *Increase:* By cuttings of unripened wood in sandy soil or by division when growth is recommencing.

DIANELLA (Liliaceæ). — Half-hardy perennials with long, rush-like leaves and small flowers in long panicles. *Soil:* Equal parts loam and peat. Shady position. *Increase:* In spring by seeds sown in heat, or by division of the roots.

DIANTHUS.—*See* CARNATIONS, PINKS, SWEET WILLIAM, SWEET WIVELSFIELD.

DIAPENSIA (Diapensiaceæ). — Hardy evergreen shrub, most suitable for the rockery, where it forms cushiony tufts. Flowers, white; July; 1-3 in. *Soil:* Moist, sandy peat and loam. *Increase:* By division in spring.

DIASCIA (Scrophulariaceæ). — Half-hardy annuals that are useful for both greenhouse and outdoor culture. *Soil:* Ordinary light soil out of doors, one part of leaf mould to two of sandy loam for indoor plants. *Increase:* By seeds sown in spring at temperature of 60°. Transplant and plant out in May or June

DICENTRA (Fumariaceæ).—Hardy herbaceous perennials that are useful for the border, rockery or pots. *Soil:* Light loam in a warm, sheltered position. For pot plants, equal parts of loam, leaf mould and sand. *Increase:* By dividing the crowns in early spring or by inserting cuttings of the side shoots in sandy soil in March or April.

DICTAMNUS (Rutaceæ).—Hardy herbaceous perennial that is suitable for the border and is remarkable for the resinous substance on the stem, which causes it to flame if a match is applied. Fragrant leaves. *Soil:* Rather dry, ordinary. *Increase:* By seeds, or more rapidly by planting portions of the fleshy roots in March or April.

DIDYMOCARPUS (Gesneraceæ). — Stove perennials, similar to primroses in habit, with umbels of flowers rising from the stemless plants. *Soil:* Sandy peat and loam with cow dung. Well-drained pots in a moist stove. *Increase:* By seeds or by cuttings rooted at temperature of 80° in spring. Water plentifully from February onwards but little from October to February. Minimum temperature, 55°.

DIEFFENBACHIA (Aroideæ). — Attractive stove perennials grown for their foliage. Stems fleshy and succulent. Leaves beautifully spotted or marked with white, cream or yellow. *Soil:* Rich loam, peat and leaf mould, with some silver sand and well-decayed manure. Plenty of water

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

needed during the growing season. *Increase:* By cuttings in heat in spring, using pieces of stem 1-2 in. long, inserted in sandy soil.

DIERVILLA (Caprifoliaceæ).—Beautiful deciduous shrubs that bear many clusters of foxglove-like flowers and are suitable for any garden. *Soil:* Loam or well-drained ordinary soil. Prune by removing dead wood in winter and flower stalks after flowering. *Increase:* By cuttings of unripe wood in June or by cuttings of ripened wood in autumn.

DIGITALIS.—*See* FOXGLOVE.

DIMORPHOTHECA (Compositæ). — Little-grown half-hardy annuals and shrubs. *Soil:* Sandy loam, leaf mould and silver sand. Grow in a cool greenhouse and plant out in May or June in light soil. *Increase:* By seed sown at temperature of 60°-65° in sandy soil in early spring.

DIOSPYROS (Ebenaceæ). — Deciduous and semi-evergreen hardy trees with plum-shaped edible and ornamental fruits. *Soil:* Ordinary. Fruits seldom ripen in Britain unless the soil is warm and position sunny. *Increase:* By cuttings over bottom heat.

DIPELTA (Caprifoliaceæ).—Hardy deciduous shrubs that produce fragrant flowers in profusion in early summer. *Soil:* Moist loam. When pruning cut away dead wood only.

DIPSACUS (Dipsaceæ).—Hardy biennials that are only suitable for the shrubbery or wild garden. *Soil:* Ordinary. *Increase:* By self-sown seed.

DIRCA (Thymeleaceæ).—Deciduous shrub like the Daphnes, bearing yellow flowers in spring. *Soil:* Deep and peaty with plenty of moisture. *Increase:* By cuttings.

DODECATHEON (Primulaceæ). — Pretty hardy perennials that are useful for shady corners of the rockery or borders. *Soil:* Moist, rich (in which they soon form large clumps) or sandy peat. Plant in January or February. *Increase:* By seeds or division in spring.

DORYANTHES (Amaryllidaceæ). — Greenhouse plants with ornamental foliage. *Soil:* Equal parts of sandy loam and leaf mould. Pot up in early spring and water little during the winter. *Increase:* By suckers.

DORYCNIUM (Leguminosæ). — Deciduous shrub with pinkish-white flowers throughout the summer, and silvery leaves. Resembles broom. *Soil:* Ordinary. *Increase:* By cuttings.

DOUGLASIA (Primulaceæ). — Hardy evergreen rock plants. *Soil:* Loam, peat and sand, with protection from excessive damp in winter. Plant in autumn or spring. *Increase:* By seed sown in spring in a cold frame or by division in autumn.

DOWNINGIA, syn. *Clintonia* (Lobeliaceæ). — Hardy annuals for rockery and baskets. *Soil:* Ordinary or rich. *Increase:* By seed sown in a frame in early spring, or in the open later.

DRABA (Cruciferæ). — Hardy alpines that form rosettes of lance-shaped leaves. *Soil:* Ordinary garden. *Increase:* By seeds or division.

DRACÆNA (Liliaceæ). — Stove ornamental evergreen plants. Leaves variegated white and green. *Soil:* Loam, decayed manure and sand, or two parts of sandy peat to one of loam. Repot in spring and if grown in a room keep in a light, airy position with no draughts. Ample moisture in summer. *Increase:* By cutting up the stems into portions, each with a joint, and inserting them in sandy soil, by offsets, by root cuttings or by seed. Each method requires a temperature of 70°-80°.

DRACOCEPHALUM (Labiatæ). — Hardy herbaceous perennials, for rockery or border. *Soil:* Light ordinary. *Increase:* By seeds or division in spring.

DRIMYS (Magnoliaceæ). — Handsome trees, requiring a warm soil to be successful. *Soil:* Chalky or good loam. Train by shortening all shoots except the leader. Protected position. *Increase:* By cuttings in a cold frame.

E

ECCREMOCARPUS (Bignoniaceæ). — Half-hardy climbers usually treated as annuals. *Soil:* Light but rich. Best site against a south wall. Protect with ashes in winter. *Increase:* By sowing freely produced seed in March in heat.

ECHINACEA (Compositæ).—Hardy herbaceous perennials. *Soil:* Ordinary or rich light loam. *Increase:* By spring-sown seed in frame in March or outdoors in April, by division in spring or autumn. Sunny position.

ECHINOCYSTIS (Cucurbitaceæ). — Hardy annual climber with prickly cucumber-like fruits following the greenish-white flowers. *Soil:* Moist rich. Plant in May by sunny support. *Increase:* Seed sown in heat in spring.

ECHINOPS (Compositæ).—Hardy biennials and perennials. Plant in a warm, well-drained border, in March or October. *Increase:* By seed or division.

ECHIUM (Boraginaceæ). — Hardy annuals, biennials and shrubs, useful for dry places in the wild garden. *Soil:* Ordinary. *Increase:* By seeds, by division or by cuttings for the shrubby species.

EDRAIANTHUS (Campanulaceæ). — Charming rock plants very close to campanulas. Plant in sunny cracks in loamy soil. *Increase:* By seeds or division.

ELÆAGNUS (Elæagnaceæ). — Ornamental hardy evergreen and deciduous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

trees and shrubs. *Soil:* For rapid growth, loamy; for silvery-leaved species, a light sandy one helps to retain the colour of the leaves. Little pruning needed to keep the bushes in shape. *Increase:* By seeds, by cuttings taken in September, by layering in spring, and the evergreens by grafting.

Evergreen species like *E. pungens* and *E. macrophylla*, the former having glossy, green leaves and silvery-white scented flowers in October and November, followed by red fruits, and the latter having creamy silvery flowers with silvery leaves, are invaluable in winter; height 8-10 ft. *Pungens* has both silver- and gold-leaved varieties.

ELM, *Ulmus.*—Tall-growing deciduous trees, largely used for seaside or street planting. They have no particular preference as to soil and are perfectly hardy. *Increase:* By seed which is sown when ripe, and the named varieties by grafting.

BEST TO GROW.—*U. campestris*, the English elm, attains a height of 120 ft. or more; with its varieties, regarded as one of the most handsome of native trees; best forms to be found in river valleys. *U. montana*, the Wych or Scotch elm, one of the most valuable species.

ELSCHOLTZIA (Labiatæ).—Deciduous semi-woody shrub, bearing small, purplish-pink flowers in late summer and autumn and mint-scented leaves, 3 ft. *Soil:* Rich loamy. *Increase:* Cuttings of young shoots, taken in midsummer.

EMBOTHRIUM (Proteaceæ). — Half-hardy evergreen shrub that ranks as one of the greatest treasures of the garden. The brilliant vermillion flowers are borne in great profusion during May and June. For effect they are only equalled by the finer forms of rhododendrons. *Soil:* Sandy peat. If grown in pots in the greenhouse, a compost of two parts of peat to one each of loam and sand. Plants reared in the greenhouse during the winter may be stood out of doors in the sun from May onwards, while those that are grown out of doors should be covered in winter with mats or leaves. All should have a protected position near a south wall, although they are reputedly hardy. A chalky soil is unsuitable. *Increase:* By cuttings in sandy peat or by seed, both methods needing a temperature of 75°. Also young shoots can be grafted on the roots. Prune by cutting out dead wood after flowering.

ENDIVE (Compositæ).—Hardy vegetables most useful for salads. *Soil:* Light, rich, deeply-dug on south or south-west borders. To obtain a succession of plants sow at intervals of three weeks from early April to July. Set rows 15-18 in. apart and thin out [illegible]

as soon as they appear. Later sowings in a frame or warm border will provide a winter crop. Provided the hoe is used fairly frequently and they are kept well watered, no further attention is needed until the plants are almost full grown, when they are ready for blanching. This is best done by covering the plants three weeks before they are to be eaten with boxes or inverted flower-pots with the drainage hole blocked in; an easier yet equally successful method is to tie the leaves together with raffia. Of the two distinct types that exist the round-leaved or Batavian will be found better for winter use as it is hardier, while the green curled is best for the autumn supply.

ENKIANTHUS (Ericaceæ).—Beautiful shrubs with lily-of-the-valley-like flowers in May and leaves that fade to most attractive tints in autumn. *Soil:* Ordinary, provided it is lime-free. Best with peat or leaf mould. *Increase:* By seed or cuttings.

EPILOBIUM (Onagraceæ).—Hardy herbaceous perennials that may be used in the rockery or water garden, according to height. *Soil:* Light, rich loam, in any position. Apt to spread in a border and become a nuisance. *Increase:* By division in spring or by seeds.

ERANTHIS.—*See* ACONITE, WINTER.

EREMURUS (Liliaceæ).—Hardy herbaceous perennials, bearing tall spikes of flowers that rise from a low rosette of rush-like leaves. *Soil:* Rich, well drained. South aspect, with protection from winds. Plant in autumn, taking care to handle the brittle roots carefully and spreading them out horizontally with the crowns several inches below the surface. Cover with leaf mould or fibre in winter and top dress annually with fresh dry soil. Ashes sprinkled round the base of the plants will keep off slugs. *Increase:* By seed sown under glass. Grow on for a year before planting out in beds or borders, where they will flower after two years. Also by division.

ERICA, Heath (Ericaceæ).—Greenhouse and hardy flowering shrubs marked by their abundance of small leaves. Hardy species. *Soil:* Apart from a very few exceptions they will not succeed on a limy or chalky soil. The best is sandy peat, but sandy loam with leaf mould is satisfactory.

ERIGERON (Compositæ).—Hardy herbaceous perennials. *Soil:* Ordinary. Moist borders or rockery. *Increase:* Seed or division.

BEST TO GROW.—Some of the species are only fit for the wild garden, but *E. alpinus* and its varieties are suited to the rock garden, similar to the alpine aster, having large heads of purplish flowers and blooming over a long period. *E. speciosus*, in June and July, large purplish flowers borne

CC-0.In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on tall stems, forms tufts, 6 in. *E. glaucus* bears a central lavender-blue flower followed by several flowers from the lateral growths.

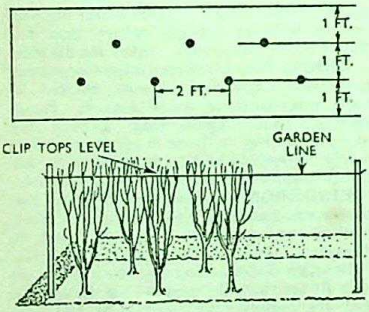
ERINUS (Scrophulariaceæ). — Hardy herbaceous perennial. *Soil:* Light, dry, with some shelter, damp in winter. Grown in crevices in the rockery or in walls, it is best planted horizontally. *Increase:* By seeds sown in permanent position in spring or autumn. By division in spring.

ERIOGONUM (Polygonaceæ).—Hardy herbaceous perennial. *Soil:* Sandy loam. Plant between rocks in the rockery in full sun. *Increase:* By division or by seeds sown in a cold frame in spring, or outside in April.

ERYTHRONIUM (Liliaceæ). — Hardy bulbous-rooted perennials. *Soil:* Ordinary, or better, equal parts of loam, peat and leaf mould. The bulbs may be set 2 in. apart and deep in March, and left for several years undisturbed provided they are top dressed every year after flowering. *Increase:* By offsets taken in August.

ESCALLONIA (Saxifragaceæ).—Hardy and evergreen half-hardy shrubs. Leaves of glossy green and an abundance of flowers reflecting all shades from deep crimson to white. When young inclined to be tender, but when well established they endure all but the most severe weather. *Soil:* Ordinary sandy loam, not too rich and unmanured. *Increase:* In August, by cuttings rooted in sandy loam in a frame or in gentle heat, also by seeds. Near the seaside they form excellent shelter hedges.

ESCHSCHOLTZIA (Papaveraceæ). — Amongst the most easily grown and most popular of hardy annuals. Succeeds anywhere in any soil. The flowers when cut last well in water. Sow in spring or autumn in flowering position.



Clip evergreen hedge plants back to one-third of their height at the time of planting. This will avoid undue loss of moisture by evaporation through the leaves.

EUCALYPTUS (Myrtaceæ). — Chiefly half-hardy evergreen trees, although one species, *E. Gunnii*, is known to be hardy. Ornamental leaves that, when young, grow horizontally close to the twigs but in the adult stage hang down on long stalks, the reason being that the young, small trees need all the sun they can obtain but, when older, and therefore taller, the sun proves too powerful for them when they have emerged from the surrounding trees.

Eucalyptus flowers have the peculiarity of possessing no petals, but are surrounded by a ring of stamens. *Soil:* Light, poor one. Plant at the end of May when about 3 ft. high and stake. They do not transplant well. *Increase:* By seed sown in pots of sandy soil. For pot culture young plants should be raised fresh each year. Pruning unnecessary. May be kept in a living-room.

EUCHARIDIUM (Onagraceæ).—Hardy annuals for beds and borders. *Soil:* Ordinary. *Increase:* By seed sown in heat in March or in the open in April.

EUCHARIS (Amaryllidaceæ).—Bulbous evergreens requiring stove culture. *Soil:* A compost of 2 parts of fibrous loam to 1 of peat with well-decayed manure and sand. Pot firmly in June or July and leave undisturbed for three or four years. Water freely during the summer, little in winter when the plants are resting. Liquid manure when flowering. Top dress annually. *Increase:* By seed sown in sandy soil in heat in early spring, or by offsets set singly in pots in June.

EUCOMIS (Liliaceæ).—Bulbous half-hardy plants. May be planted out in ordinary, light, rich soil in September, 6 in. deep and 12 in. apart. Best near the wall of the greenhouse, but even then requiring winter protection. For greenhouse plants use a compost of sandy loam, decayed manure and sand. Liquid manure when flowering. *Increase:* By offsets in September or October.

EUCRYPHIA (Eucryphiaceæ). — Interesting flowering shrub requiring shelter from cold winds and a sunny position. *Soil:* Ordinary, or better, a mixture of peat and loam. Not chalk. Plant in autumn and mulch or grow amidst a carpeting dwarf shrub, as it likes a cool root run. *Increase:* By seeds in sandy, peaty soil or by layering.

EUGENIA (Myrtaceæ). — Attractive evergreen shrubs. *Soil:* In pots use a compost of two parts of sandy loam and one of leaf mould, while if they are grown out of doors, as they may be in warm gardens, plant in sandy peat or loam and peat. *Increase:* By cuttings under glass in summer.

EUONYMUS (Celastraceæ). — Hardy and half-hardy evergreen and deciduous shrubs with leaves variegated white and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

yellow on a green background. *Soil:* Ordinary. The evergreens make good edgings to beds, hedges, shrubberies, etc. Plant these in spring or autumn and the deciduous species at any time in winter. *Increase:* By cuttings of same season's growths taken in early autumn. Prune in spring or autumn.

EUPATORIUM (Compositæ). — Herbaceous perennials and half-hardy shrubs.

Hardy species.—Soil: Ordinary. Plant in autumn or spring and increase by division at planting time.

Greenhouse Plants.—Soil: Compost of loam and manure in equal proportions with a little sand. Pot in March or April and prune when flowering is finished. Keep fairly dry when the plants are resting.

EUPHORBIA (Euphorbiaceæ).—Hardy perennials and tender shrubs, including poinsettias. Greenhouse plants. *Soil:* Compost of fibrous loam, decayed manure and sand. After new growth has started in March, when young shoots are developing, turn out the plants and root-prune slightly. Then repot the plants and prune to within two or three buds at the end of April. Pot later into pots of flowering size. Keep in a sunny frame out of doors in summer and return to the greenhouse, where they may be kept fairly dry, during the winter. Young plants are formed by removing shoots instead of pruning the old plants in May, and inserting the shoots singly in pots of sandy loam and peat, afterwards keeping the plants until they are rooted, in a propagator in a temperature of 85°. Transfer to larger pots as required and harden off for planting out in a frame for the summer. Water frequently and shade from hot sunshine. Transfer to the greenhouse in September and apply stimulants until flowering is over. Keep fairly dry and cool in winter.

The hardy species are too coarse for the choice border, but suit the wild garden. *Soil:* Ordinary. *Increase:* By seeds or division.

EVENING PRIMROSE, *Œnothera* (Onagraceæ).—Popular hardy annuals and perennials that are naturalized in many parts, yet originally came from America. *Soil:* Ordinary, or a light, warm, sandy one. All may be raised from seed and the perennials by cuttings or by division. The latter are best left undisturbed for three or four years.

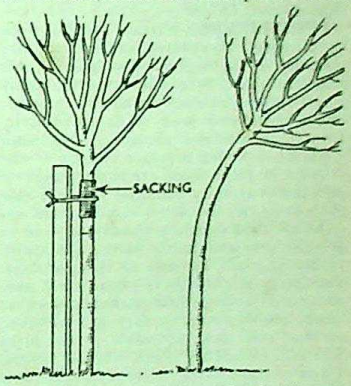
BEST TO GROW.—The annuals formerly known as Godetias have their variously coloured flowers open during the day. The perennials will be found to be at their best in the evening when most of them are pleasantly fragrant.

EVERLASTING FLOWERS.—Flowers whose bracts or colour remain after they are dried. Gather them in summer when they are ripe. All ferns in can be dried and preserved, and will keep their colour for some months. The best for preserving are Helichrysums, Rhodanthes, Xeranthemums and Acrocliniums.

F

FAGUS.—*See* BEECH.

FERNS.—This comprehensive term includes both hardy and half-hardy plants that have many uses both in and out of doors. Generally regarded as shade-loving, although it will be found that many varieties make a useful addition to the sunny border. *Soil:* In ordinary soil plenty of decayed leaves should be used, and sand, but the ideal is made up of equal parts of loam, peat and leaf mould, and sand. Some forms like lime rubble in the soil and all should have good drainage with provision for adequate moisture at the roots. Pot plants must have broken crocks in the pots. *Increase:* Most of the hardy species can be increased by division of the roots, while those that prove difficult



Trees should be staked while planting, so that the support can be positioned from the start and, therefore, will not damage the roots

in this way must be raised from seed, or rather spores that form on the under surface of the fronds, as ferns do not flower. Sow the spores by brushing them off the fronds on to sandstones or a surface of fine soil, or by laying a piece of the frond on sandstones. If covered with a bell-glass this helps to conserve moisture and the spores develop into tiny plants that may be potted off singly and later planted out as desired. Spores that are more stubborn in developing may be kept in a cold frame. The best time for removing the spores is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pots should be turned out every year and fresh soil used for repotting. *Position of Ferns:* For filling up sunless, damp quarters in the garden ferns are invaluable, yet provided they have a moist root-run they thrive anywhere. Ferns in rooms often fail for two reasons—under- or over-watering and the admittance of cold draughts.

Of the many species found wild in Britain the following provide a good choice: *Allosorus crispus*, Parsley Fern; Blechnum, Hard Fern; *Botrychium lunaria*, Moonwort; Gynogramma, Gold and Silver Ferns; Lastrea (syn. Nephrodium), Male Fern; Polypodium, Oak or Beech Fern; Polystichum, Shield Fern; Pteris, Bracken; Trichomanes, British Fern.

FERRARIA (Iridaceæ). — Half-hardy bulbs best grown in pots, although they can be planted out in warm borders if set very deep. *Soil:* Pots of compost of sandy loam with peat. *Increase:* By seeds sown when ripe or by offsets. When the foliage has withered keep the bulbs dry. Summer temperature, 50°-60°.

FERTILIZERS.—Certain foods, such as nitrogen, phosphates and potash, are essential to the well-being of plants. On soils that have been cultivated for many years these elements, naturally present, are deficient and have to be supplied by natural or artificial manures. Likewise, if plants requiring a larger amount of one or other of these foods are to be grown on soil that naturally contains little of this food, then this deficiency can be made up.

All the food taken by plants has to be in soluble form and in the form most useful to the plants. Because of this, artificial manures or fertilizers have a great advantage over natural manures, such as dung, shoddy, etc., as they are presented in the form most agreeable to the plant and take immediate effect, whereas natural manures take time to acquire the form necessary to the plants.

Types of Fertilizers.—Each of the three necessary substances is obtainable only in the form of compounds, and the action of each should be studied. Nitrogen promotes growth. Phosphates promote health, fruitfulness and general development. Potash improves quality. By knowing the effect of each we know which to use. For instance, a vigorous-growing yet shy-bearing fruit tree will not need nitrogen but rather phosphates.

A fertilizer containing all three, as well as the all-important lime, consists of one part each of sulphate of ammonia (nitrogen), sulphate of potash, steamed bone flour (to prevent the whole from caking) and four parts of superphosphate of lime. The value of [illegible] estimated according to the amount of quicklime present in it, but in whatever form it is given it eventually becomes carbonate of lime through the action of the carbon dioxide in the air. Lime acts as the greatest corrective on soils that have become acid through over-manuring.

Nitrogenous Fertilizers. — Nitrogen is supplied as sulphate of ammonia, as nitrate of soda, nitrate of lime, ammonium phosphates, and nitro-chalk.

Phosphatic Fertilizers.—Supplied in superphosphate, basic slag, and other forms.

Potash.—Is found in sulphate of potash, muriate of potash, potash salts and kainit. Many of these compounds contain more than one plant food. Modern experiments tend to produce fertilizers that combine all in one mixture. The amounts of each to be used vary according to the individual soil and its requirements. Some of the vegetable crops belonging to the Leguminosæ family have the quality of adding to, instead of taking from, the amount of nitrogen in the soil, and after such crops have been grown it would naturally not be necessary to add nitrogen to the soil. A general estimate of the need of an ordinary garden of half an acre in size, laid out with lawn, flower beds and some trees, has been compiled. It is estimated that it will need four cwt. basic slag, two cwt. superphosphate, half cwt. kainit, two st. nitrate of soda, and half cwt. sulphate of ammonia.

Any other of the compounds containing an equivalent of any one of these foods may be substituted. It is impossible to give exact quantities as only the gardener who knows what his land produces and what he has grown on it during the past few years can do this.

By the Fertilizers and Feeding Stuffs Act the constituents of all fertilizers must be stated by the seller unless he is selling a specially-requested mixture of more than one. This is unnecessary when the required particulars are stated on the bulk from which the material is taken.

FERULA (Umbelliferæ).—Hardy herbaceous plants. Leaves daintily cut like fern fronds. *Soil:* Ordinary. Plant from November at any time in winter. Fine individual specimens. *Increase:* By seeds sown in autumn and transplanted the following year or by division.

FICUS.—*See* FIG.

FIG, *Ficus carica* (Moraceæ).—Partly hardy evergreen and deciduous trees and shrubs bearing edible fruits that have been regarded as delicacies for centuries. *Soil:* The poorer the soil the better as the fruit yield is greater. Best grown against a south wall. Plant in April or October. Dead and old wood must be cut out in early

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

summer and the points of the shoots pinched back.

The only crop which can ripen out of doors is the third and last to be borne, so all but the smallest figs have to be taken off in autumn as the plants bear on the previous year's wood. Protect with mats, which can be removed in April. Watering and manuring are rarely necessary. Under glass they are best grown in pots. For this purpose use turfy loam and bonemeal and pot in winter. They should be repotted every second year and carefully watered.

FILBERT.—*See* NUTS.

FLAX, *Linum* (Linaceæ).—Hardy annuals and perennials for sunny beds and borders. *Soil:* Ordinary, and light rich for the perennials. *Increase:* The annuals by seeds, the perennials by seeds and by division in spring. The seed can be broadcast and the young plants thinned out when they are large enough to handle.

BEST TO GROW.—*L. grandiflorum* and its red and scarlet varieties are much used as edgings to summer beds. 1 ft. Annual. Sometimes grown in pots in good mould with sand. Seed can be sown in April in a frame and the seedlings, when they appear, transplanted out of doors.

FORGET-ME-NOT, *Myosotis* (Boraginaceæ). — Charming early-flowering hardy perennials, valued for beds, borders and rockeries. *Soil:* Moist in shady sites or ordinary. Most species are best treated as biennials. *Increase:* By seeds sown in the open in spring or by division.

BEST TO GROW.—*M. alpestris*, having blue flowers fragrant in the evening, is best in the rockery. *M. palustris*, the true forget-me-not, is useful for wild gardens; its varieties with white, pink or blue flowers are useful for spring bedding.

FORSYTHIA (Oleaceæ). — Hardy deciduous flowering shrubs usually bearing golden flowers in March on arching, leafless branches. *Soil:* Rich loamy or ordinary. Plant in autumn and cut back when flowering is over. Grown as a climber, it may be trained on a north wall. *Increase:* By cuttings taken in summer, also by layering.

FOTHERGILLA (Hamamelidaceæ). — Hardy deciduous shrub most beautiful during April and May when its fragrant inflorescence of white or pinkish flowers is seen. *Soil:* Moist, sandy loam and peat, or ordinary. *Increase:* By seeds sown in sandy peat in spring in heat, by cuttings or by layerings. *F. monticola* is beautifully coloured in autumn.

FOXGLOVE, *Digitalis* (Scrophulariaceæ).—Hardy biennials and perennials highly valued for borders and the wild garden. *Soil:* Moist, rich ordinary in a shady place. [illegible] they do not flower freely in a very dry position. *Increase:* By seeds sown out of doors in April, the resultant seedlings being transferred to a permanent position in autumn.

FRANCOA (Saxifragaceæ).—Half-hardy perennials usually grown as biennials in the greenhouse. *Soil:* Pots of good loam with leaf mould and sand. *Increase:* By seeds sown in sandy peat in gentle heat in spring, or by division when planting or potting in April or May.

FRANKENIA (Frankeniaceæ). — Evergreen creeping hardy flowering plant. *Soil:* Light sandy. Plant in April or autumn in a dry border or in the rockery. *Increase:* By seeds in a cold frame in spring or by division in autumn.

FREESIA (Iridaceæ).—Fragrant greenhouse bulbous plants from the Cape. *Soil:* Pots containing a compost of equal parts of loam, leaf mould and animal manure. A greater amount of sand and a little bonemeal may be substituted for the manure. By potting from July to September successionally plants can be had in bloom for the first months of the year. Set the bulbs 2 in. deep and keep in a cold frame until they begin to grow, when they should be placed near the glass in the greenhouse.

Liquid manure helps the flower buds to form. They must be well watered during the growing period and after flowering when the tops have died down they must be allowed to dry. *Increase:* By offsets for the named varieties, taken off when repotting; also by seed sown in August when it is ripe. Soak the seeds for a day before sowing and sow in sandy loam and leaf mould. When the seedlings show, thin them to five in a pot. No further shifting is advisable as they do not transplant well.

BEST TO GROW.—The modern freesias are nearly all derived from two or three species which were grown more for their perfume than for their creamy flowers. By growing one of the old-fashioned flowers at the same time the lack of scent in the modern hybrids will be more than atoned for.

FREMONTIA (Sterculiaceæ). — Deciduous flowering shrub or small tree best grown against a wall in most gardens. The flowers produced in profusion in summer are large, cup-shaped and golden-yellow. *Soil:* Poor. It thrives in chalky soils and needs full sun. *Increase:* By seeds or by cuttings under glass. It is as well to keep a few spare plants in pots as it is not long lived.

FRENCH GARDENING. — By this term is usually meant an intensive form of culture, especially of vegetables and salads, in order to obtain three successive crops in a year without the expense of greenhouses.

Requirements.—Perfect condition of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

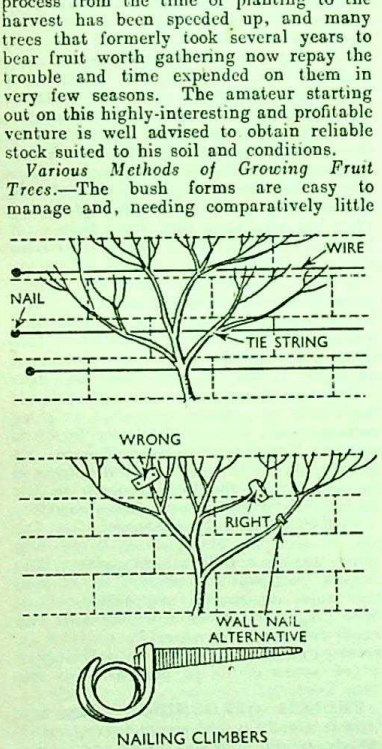
soil, which must be manured until it is black and very deeply dug. Manure is incorporated, and artificial fertilizers added as required.

Crops.—In March or April the earliest maturing varieties of the usual crops may be sown. These ripen in July and August and must be replaced at once. By using a system of rotation and classifying the crops as green, root and leguminous, greater gain will be derived from each plot. Intercropping can also be practised, small crops being set between the rows. In winter the crops must be protected with bracken or, better still, cloches.

FRITILLARIA.—*See* CROWN IMPERIALS.

FRUIT AND ITS CULTURE.—Whatever the size of a garden may be it is possible with a little ingenuity to grow productive fruit trees and bushes. Due to the efforts of experimenters the whole process from the time of planting to the harvest has been speeded up, and many trees that formerly took several years to bear fruit worth gathering now repay the trouble and time expended on them in very few seasons. The amateur starting out on this highly-interesting and profitable venture is well advised to obtain reliable stock suited to his soil and conditions.

Various Methods of Growing Fruit Trees.—The bush forms are easy to manage and, needing comparatively little space, are replacing the taller standards and half-standards. These latter are useful for providing shade but are not much grown in modern orchards as they need 20-30 ft. between each two trees. For a very small garden the bush and pyramid forms are best, while where a wall is available the cordon and the fan-trained trees take least room and can be brought to bear most prolifically. Apples, pears, plums, apricots, peaches, nectarines and gooseberries may all be grown in any one of these ways.



Wires at intervals on a wall, suitable wall nails and loops of sacking are convenient methods of training wall climbers

Soil: Although it is the common thing to say that fruit grows on any soil, this is scarcely true. It is more true to say that any soil can be prepared to grow fruit. Soil on which green vegetables, herbaceous perennials or coarse herbs have been growing suits fruits. If too heavy it may be lightened by digging in road grit and straw manure, and, if too light, by using heavy manure, leaves or vegetable refuse. The ideal is a good loamy soil not made too rich by over-manuring and thoroughly well drained, yet some of the soft fruits, like gooseberries, raspberries, loganberries and black currants, are best in a damp heavy soil.

Position and Planting. — The best position is on a slope facing south, with some shelter from north and east and with no tall trees or buildings to keep out sunshine. A walled-in garden is excellent, as a great variety of fruits can be grown against the walls and thus take little room. The cordon system is most useful along pathways but requires more attention than the bush, and low-growing espaliers make charming fences. In addition to studying the position of the individual tree so as to give it shelter from high winds yet allow plenty of sunlight, the nature of the trees must be known. A self-sterile variety may have been planted for years and produce no fruit, yet if another variety that flowers at the same time is planted near it to effect pollination, it will no doubt bear heavily. Before planting, the soil must be well prepared. Dig a hole large enough to take all the roots spread out and break up the subsoil to provide drainage. If the subsoil is poor it can be replaced with loam, and if very wet must be drained by putting a layer of clinkers or broken brick. Set the tree in position and trim off any roots that are damaged or are too long and straggling. Throw fine soil over roots and tread this in. Repeat until the hole is filled in and see that the tree is quite firm when finished, as more trees are lost each year by insecure planting than by any other defect. Stake the trees as soon as they are planted. The best time to plant is in the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

early winter when the soil is still warm, but the trees should be in by March.

Manure. — Fresh manure instead of helping the trees is definitely injurious, as it tends to produce excessive leafage and woody growth at the expense of the crops. Artificial fertilizers are better as they act more quickly and do not produce rank growth. Basic slag and crushed bones are useful on heavy soils, while bone flour and superphosphate of lime tend to help light soils. Heavily bearing trees benefit by an annual mulch of decayed manure given a fortnight before flowering, and some form of potash should be applied at regular intervals, especially on light soils, as it increases size, colour and flavour, besides making the trees more disease-resistant. Lime, too, is necessary, and can be given in the form of nitrate of lime at the rate of 1 oz. to the square yard, in early spring.

Pruning.—The amount of pruning required depends largely upon the type of tree, but two important facts should be borne in mind, vigorous trees are not always the best bearers and should be pruned accordingly, and weakly dwarfish trees may sound their death-knell by overbearing and should be hard winter-pruned. Bush trees should have the centres kept open and any wood that is cut out must be cut right back, as otherwise short, non-fruiting branches grow from the old wood. Pyramids should have the leader extended and the laterals summer-pruned.

The chief object of pruning is to produce shapely trees, bearing the greatest possible amount of fruit of a good quality. The pruner should study the characteristics peculiar to each type—for instance, apples bear on wood that is two and more years old; black currants, raspberries and most soft fruits, as well as peaches, nectarines and Morello cherries, bear on the previous season's wood. For the latter class, pruning consists of cutting out the wood that has borne in the autumn and leaving the young shoots. For the former, it means that young wood not wanted for extension is cut back, and a network of older or main branches is built up.

APPLES.—May be grown in any type of soil, preferably in light, well-drained loam and in an unexposed position on a northern slope.

BEST TO GROW.—*Dessert varieties.*—Early: "Laxton's Exquisite." Mid-season: "James Grieve," "Lord Lambourne." Late: "Cox's Orange Pippin." *Cooking varieties.* — Early: "Arthur Turner." Mid-Season: "Peasegood Nonsuch," "Rev. W. Wilks." Late: "Lane's Prince Albert," "Wagener."

PEARS.—The [illegible] forms are most popular as they bear fruit most quickly; but they are often grown against a wall, as they flower earlier than apples and therefore need protection from winds while obtaining full sunshine. As cordons by a wall they have to be planted only 2 ft. apart. To increase stock they are grafted on wild pears or on quinces, which dwarfs the trees and produces early fruiting.

Dessert varieties. — Early: "Laxton's Superb," "Williams Bon Chrétien." Mid-Season: "Conference," "Doyenné du Comice." Late: "Winter Nelis."

Cooking varieties.—"Beurre Clairgeau," "Catillac."

APRICOTS.—Fan-trained on walls in the sunniest situation possible, where they can be planted in the middle of October. The "Moor Park" variety can be raised true from seed, otherwise they are increased by budding on plum stock. "Breda" and "Moor Park" are the hardiest.

CHERRIES.—Can be grown in any of the styles, in the open or against a wall. Dessert trees fruit on old wood like apples and pears, but the cooking cherries, like the soft fruits, ripen on the last year's growth. A warm, light soil is best.

Sweet.—"Bigarreau Napoleon," "Governor Wood." Both late-flowering and self-sterile, but will pollinate each other.

Sour.—"Morello."

PLUMS.—Usually grown as standards but increasing in popularity as fans for walls which, because of their early blooming, should face west. Frequent thinning of the fruits is necessary.

Some satisfactory varieties are: "Early Laxton," "Denniston's Superb," "Victoria," "Marjorie's Seedling."

Sterile varieties are: "Grand Duke," "Late Orange" and "Pond's Seedling."

Pests.—Trees that have been infected with pests need a strong wash during the winter. Use lime sulphur, a caustic wash, or tar oil preparation.

STRAWBERRIES. — These need special culture. The ground must be enriched and freed from weeds, as they have to stay in the same ground for several years and cannot be fed externally. Plant as soon as runners are obtainable; if later than August they must not be allowed to bear the following year. Plant with plenty of space between the plants and tread the soil firm. Keep the crowns above the soil away from the moisture, and hoe in spring. Straw is placed round the plants to keep them free of insects. After fruiting, remove all dead leaves and wood and give a dose of fertilizer. *Increase:* By layering, and renew the strawberry bed every three years, or renew one-third each year.

FUCHSIA (Onagraceæ). — Deciduous [illegible] and hardy shrubs of great beauty.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Soil: Compost for pots, two parts of fibrous loam, one part of manure and leaf mould with silver sand. Pot in February or March and keep in a greenhouse or room where they will remain in flower for a long period. The varieties suitable for bedding can be reared in the greenhouse and planted out in June. The hardy plants may be grown in ordinary garden soil and if, as sometimes happens, they are cut to the ground by frost, new shoots spring up the following year. *Increase:* By seeds, layers or by cuttings, the latter method being the most usual. By keeping old plants in warmth in early spring they bear new shoots which are removed and inserted in pots at a temperature of 60°. When rooted they are potted singly. Pinch out the points to induce bushy growth. By July they are ready to flower and if given artificial manure will bloom throughout the autumn. White and green fly can be eradicated by fumigation.

FUNKIA (Liliaceæ). — Pretty border plants, having large variegated leaves and fragrant flowers in July and August. *Soil:* In beds or borders, ordinary enriched with manure; in pots, use a compost of two parts of loam to one of decayed manure and river sand. Plant in spring or autumn or pot in April or May. In either case add liquid manure to plants in flower. The best position out of doors is a well-drained, sunny border. *Increase:* By dividing the crowns in March or April.

FURZE.—*See* GORSE.

G

GAGEA, Yellow Star of Bethlehem (Liliaceæ). — Hardy deciduous bulbous plant, for sunny borders or in turf. *Soil:* Sandy. Plant 3 in. deep and 3 in. apart, Aug. to Nov. Leave undisturbed until the lack of flowers indicates overcrowding. *Increase:* By offsets, treated as bulbs.

GAILLARDIA, Blanket-flower (Compositæ).—First introduced 1787. Hardy annual and perennial herbaceous plants. *Culture of annuals:* Sow under glass March to April and plant out in May in moderately light rich soil, and sunny position. Good for cutting. *Culture of perennials:* Dry soil in a sunny position. Where heavy frosts occur they should be wintered in a cold frame. *Increase:* By division of plants Oct. to March, or cuttings of roots laid in shallow boxes of sandy soil, Feb. or March.

GALANTHUS.—*See* SNOWDROP.

GALAXIA (Iridaceæ. Deciduous bulbous plants, chiefly for greenhouse cultivation, but can be grown outdoors provided the roots are given sufficient protection in the winter. *Soil:* Sandy loam, two parts, peat, one part, leaf mould, one part, sand, one part. *Position:* Sunny border. *Time to plant:* Autumn. *Increase:* By seeds sown in spring, or by division of the roots.

GALEGA, Goat's Rue (Leguminosæ).—Vigorous, hardy herbaceous perennial, useful for wild garden and good for cutting. *Soil:* Any soil. Position, open border or shrubberies. *Increase:* By sowing seeds ½ in. deep in April. Division of roots Oct. to March.

GALIUM (Rubiaceæ). — Hardy perennial herbs, used chiefly for rock gardens. Possess more or less the dyeing qualities of Madder. Plant Oct. to March. *Soil:* Ordinary, in sunny position. *Increase:* Division of roots at planting time, or by seeds sown out of doors in April.

GALTONIA, Spire Lily (Liliaceæ).—Hardy bulbous flowering plants, deciduous. Plant Oct. to March. *Soil:* Ordinary well drained, in open, sunny position. Plant bulbs 6 in. deep and 6 in. apart. *Increase:* By offsets treated as bulbs in autumn, or by seeds sown ½ in. deep in shallow boxes of sandy soil in spring or autumn in the cold frame.

GARCINIA, Mangosteen-tree (Guttiferæ).—First introduced 1789. Evergreen tree, bearing fruit, with ornamental foliage. Requires stove culture. The fruits are the size of an orange, golden-brown in colour, and are edible. *Soil:* Two parts peat, one part loam and sand, in pots or light boxes in light part of plant stove. Potted in Feb. to March, and pruned at same time. Temp.: March to Oct., 65°-85°; Oct. to March, 55°-65°. *Increase:* By cuttings of firm shoots 2-3 in. long inserted in silver sand, in a close propagating case with strong bottom heat.

GARDENIA, Cape Jasmine (Rubiaceæ). —First introduced from China 1754. Evergreen flowering shrubs, requiring stove culture. *Soil:* Compost, two parts loam, one part each of peat, leaf mould and sand. Moist atmosphere required at all times, and does best when planted out. Sometimes grown in pots, 6-7 in. being suitable sizes. Winter temp. 60°, summer 80°. *Increase:* By cuttings of young shoots, inserted in pots of sandy peat in propagator, temp. 75°, early spring.

GARRYA (Cornaceæ).—An evergreen, winter-flowering shrub which blooms in mid-winter. *Soil:* Ordinary garden soil, in a sunny, sheltered position. Plant in May.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Increase: By cuttings under a bell-glass in September, or by layering in autumn. Prune in May by cutting out dead wood and trimming the long shoots.

GAULTHERIA (Ericaceæ).—A pretty shrub with dark green leathery leaves and small sprays of pink and white bell-flowers. Good for planting under the shade of trees. *Soil:* Peaty soil. They hate lime. *Increase:* By division of roots or propagated by layers, in early autumn.

GAYLUSSACIA, Huckleberry (Vacciniaceæ).—First introduced 1772. Evergreen or deciduous shrub, bearing berries, with red foliage in autumn. *Soil:* Moist and peaty. *Increase:* By layering in the autumn or by seeds.

BEST TO GROW.—*G. brachycera*, white flowers, shaded pink, with box-like leaves of bright red when young, but dark glossy green when older; loves shade; height 6-12 in. *G. resinosa* (baccata), deep pink flowers in June succeeded by the best-flavoured of all edible huckleberries; height 3-5 ft. *G. ursina*, white flowers, shaded red, succeeded by dark purple-black berries; height 3-5 ft.

GAZANIA (Compositæ).—A half-hardy perennial which flowers the first year from an early sowing. The plants spread close on the ground, and produce brilliant orange and yellow, daisy-like flowers of various shades. Height 9-12 in. *Soil:* Ordinary soil, often grown in chalky beds at the seaside. Likes sunny position. *Increase:* By cuttings of shoots in March to Aug., and inserted in sandy soil under a bell-glass.

GENISTA, Rock Broom (Leguminosæ).—These shrubs are closely allied to Cytisus, and require the same treatment. The dwarfs of both genera are indispensable alpines. Height anything from 2-20 ft. *Soil:* Plant in a light soil in October, in a dry, sunny position. Prune out old wood and trim into shape just after flowering. *Increase:* By seeds sown ¼ in. deep in early spring, or by layering in late autumn.

GENTIANA, Fell Wort (Gentianaceæ).—Named after Gentius, King of Illyria, who first used the roots for medicinal purposes. Hardy perennial. The dwarf varieties suitable for rockeries. Height varies from 3 in. to 2 ft. *Soil:* Two parts loam, one part peat and one part grit and coarse sand. Plant in sunny position in September, October, March or April. Soil should be fairly dry in winter and moist in summer. *Increase:* By seeds sown just below the surface of the soil in well-drained pots or pans of sandy soil, or by division of roots in March. *G. acaulis*, blue flowers, 6 in. high, March to June. *G. Farreri*, pretty silvery-blue flowers, with white throat, 6 in. high, August to October. *G. Gracialpa*, very bright, blue flowers, 1 ft. high, April to July. *G. sino-ornata*, rich blue flowers, 6 in. high, September to November.

GERANIUM (Crane's-bill).—So named because the seed-pod resembles the beak of a crane. Hardy herbaceous perennials. *Soil:* Ordinary rich soil, well drained, and in a sunny position. Suitable for the rock garden. *Increase:* By division of roots from October to March, or by seeds sown in March or April in the open.

See also PELARGONIUM, ZONAL for "bedding geraniums."

GESNERA (Gesneraceæ).—Named after a celebrated botanist of Zürich, Conrad Gesner. Tuberous-rooted stove plant, first introduced in 1893. Perennial. *Soil:* Two parts loam, one part each of leaf mould, decayed manure and silver sand, in well-drained pots or pans, in shady position in plant stove. Start tubers in leaf mould with a little bottom heat. Water freely during growth. After flowering withhold water gradually till leaves die down, and store pots under the staging until repotting time. 50° temperature in winter and from 65°-75° in summer. Height about 1 ft. *Increase:* By cuttings of young shoots in spring, or by seeds sown on surface of well-drained pots of sandy soil.

GETHYLLIS, Cape Crocus (Amaryllidaceæ).—Deciduous bulbous stove plants. First introduced 1780. *Soil:* Compost of equal parts of peat, loam and sand. Plant in August to November in well-drained pots, singly, placing points just below the surface. Cover with ashes in cold frame or greenhouse till growth commences, and water sparingly until flowers begin to fade. When foliage dies down, keep dry until potting time. *Increase:* By seed sown ½ in. deep in a cold frame or greenhouse in spring, in well-drained pots of sandy soil. Also by offsets treated as bulbs at potting time.

GEUM, *Avens* (Rosaceæ).—Good plants for border or rock-work. Herbaceous perennials, and very good for cutting. Bloom in summer. *Soil:* Ordinary rich soil. *Increase:* By seeds sown in April in the open, or by division in March or October.

GILIA (Polemoniaceæ).—Annual, biennial and semi-shrub. *Soil:* Light sandy soil for all the species, in sunny position. *Increase:* Annuals by seeds sown just below the surface of the soil in April: thin out the seedlings in May, about 3 in. apart. Biennials are increased by sowing the seeds in pans or boxes in January, pricking off the seedlings as soon as large enough. The semi-shrubs are increased by sowing in pans or boxes in late summer, pricking off the seedlings as soon as large enough.

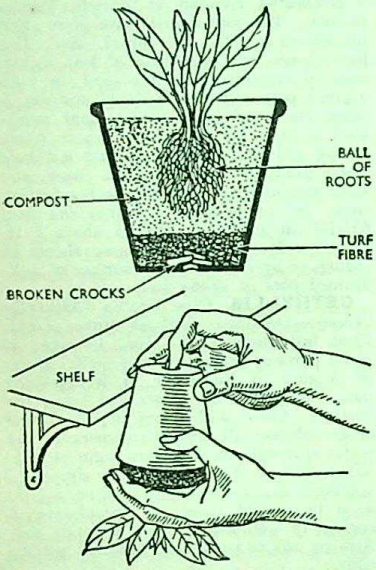
GLADIOLUS (Iridaceæ).—Hardy bulbs which can be grown with success even in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

town gardens. There are a few greenhouse varieties.

Plant the bulbs outdoors at fortnightly intervals from the middle of March to the middle of May, to ensure a succession of bloom. Plant in well-drained, deeply-dug soil, with which sand and leaf mould have been incorporated. On heavy soils place a little sand under the corms when planting. Space the corms 6 in. apart and plant 6 in. deep. This depth is sufficient to prevent the spikes toppling over. Staking is not then required except for exhibition blooms. Weak doses of liquid



If the rim of a pot is tapped on the edge of a shelf, as shown in the illustration above, the plant, including the ball of soil, will fall out intact into the hand

manure may be given at fortnightly intervals when the flowers begin to open. Never apply fertilizers after a dry spell without watering first.

Pot up greenhouse varieties in October or November in a compost of one part loam and one part well-decayed manure and sand. Plant the corms 1 in. deep and allow five corms to a 6-in. pot. These varieties will thrive out of doors if a well-drained, warm, sandy soil is available.

Gladioli can easily be propagated by seeds. Sow in April in drills 6 in. apart out of doors. Cover with a thin layer of light soil. In the autumn lift the plants and store in sand. They should flower the following year.

BEST TO GROW.—*Large-flowered type:* Chiefly raised from the old scarlet variety brenchleyensis, native of S. Africa. "Brilliant," bright scarlet; "Chris," dark maroon; "Crimson Glow," crimson-red; "Early Sunrise," pure salmon; "Flora," soft yellow; "Odin," salmon-orange; "Willy Wigham," creamy-white, carmine blotch.

Primulinus type ("Maids of the Mist"): Small-flowered, with top petals forming a hood. "Alice Tiplady," orange saffron; "Golden Girl," clear yellow; "Maiden's Blush," soft pink; "Orange Brilliant," orange; "Psyche," brilliant orange-red; "Souvenir," bright yellow.

GLAUCIUM, Horn Poppy (Papaveraceæ) —Hardy perennial that flowers the first year from seeds. The flowers resemble the single poppies in shape. The seed-pods are long and horn-like. *Soil:* Sandy soil in warm position. *Increase:* By seeds sown just below the surface of the soil in May. Transplant in July or August.

GLOBULARIA, Globe Daisy (Globulariaceæ).—Hardy perennial suitable for border or rock work. *Soil:* Ordinary, rather moist. Position, sunny. Plant autumn or spring. *Increase:* By seeds sown on the surface in boxes, or by division in autumn or spring.

GLOXINIA (Gesneraceæ).—A tuberous greenhouse perennial with wax-like, trumpet-shaped blooms on erect stems, and can be cultivated either in a window or cool greenhouse. *Soil:* Equal parts of ordinary light garden soil. Position, well-drained pots close to glass in plant stove while growing. *Increase:* By seeds sown in well-drained pots, only just covering the seeds. The boxes should be dipped into tepid water, and after moisture has risen to the side-face, place in a temperature of 70°-75° to germinate. When large enough, prick out into new boxes of soil and when they are ready, pot into small pots. Do not wet the flower buds.

GNIDIA (Thymeleaceæ). — Greenhouse evergreens. *Soil:* Two parts fibrous peat, one part of loam, and one part silver sand. Pot in March, and keep them shaded in the summer, and in the winter in a temperature of 40°-50°. Use rain water, not tap water. *Increase:* By cuttings of young shoots 2-3 in. long in sandy peat under a bell-glass.

GOAT'S BEARD. *See* SPIRÆA.

GODETIA (Onagraceæ). — Summer-flowering annuals. They also make an effective display in the greenhouse in spring. Plants are hardy and very simple to grow. The long, handsome sprays of the tall kinds make lovely decoration for

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

vases. *Soil:* Mixture of well-drained leaf mould, loam and sand. *Increase:* By seeds sown in March and April in the open for a summer display, and under glass for a spring display. Height from 9 in. to 2 ft.

GOLDEN FEATHER, *Chrysanthemum Parthenium aureum* (Compositæ).—A hardy perennial. Very lovely for colour effects in bedding and edging, and generally treated as an annual, the seeds being sown in heat under glass in spring. Height 4-12 in. *Soil:* Ordinary. The seedlings should be planted out at the end of May, and require to be constantly pinched to make them dwarf and compact.

GOMPHIA, Button Flower (Ochnaceæ). —Stove evergreen. *Soil:* Sandy loam with little peat. A temperature of 60°-80° in summer, and 50°-55° in winter. Pot in February or March. *Increase:* By cuttings of firm young shoots under a bell-glass.

GOMPHRENA, Globe Amaranth (Amaranthaceæ).—Pretty half-hardy annual, well adapted for cool greenhouse in summer. Everlasting flowers, which may be dried and kept for winter decoration. *Soil:* Light and sandy. Liquid manures as the flowers grow will benefit them. *Increase:* By seeds sown in pots in March, in a temperature of 75°. Transplant singly in 5-in. pots.

GOOSEBERRY.—*See* FRUIT AND ITS CULTURE.

GORSE, *Ulex*.—Known also a furze or whin. Spiny shrub related to the brooms. It thrives on heathy, sandy wastes, and is in bloom many months of the year. The double-flowered form of the common plant (*flore pleno*) is particularly good. *Soil:* Sandy. *Increase:* By cuttings in spring or autumn, or by seeds sown singly in small pots, and the young plants put out in their permanent positions without repotting. They dislike disturbance.

GOURDS, ORNAMENTAL (Cucurbitaceæ).—A very large class, bearing fruits of different shapes and colours. Usually grown as half-hardy annuals in the same manner as vegetable marrows. Very suitable for growing over arches and against pillars. *Soil:* Fairly rich, very moist. *Increase:* By sowing seeds in frame in April, planting out in June. Can be sown where they are to grow in May. The most popular kinds are: "Egg-shaped," "Turk's Cap" and "Yokohama."

GRAFTING.—*See* PROPAGATING PLANTS.

GRAMMANTHES (Crassulaceæ). — Half-hardy annuals. *Soil:* Light, sandy. Requires sunny position in rockeries. *Increase:* By seeds sown on the surface in well-drained pots. The seedlings should be transplanted outdoors in spring.

GRAMMATOCARPUS, Cup Flower (Loasaceæ) — Greenhouse annual. *Soil:* Ordinary garden soil. Sunny position. *Increase:* By seeds sown in heat in spring. The seedlings should be hardened off later on, and planted out in June.

GRAPE.—*See* VINE.

GRAPE HYACINTH (Muscari). — Hardy bulbs. Excellent for borders that are shaded by trees. They are well adapted for pot culture and for rockwork. *Soil:* Any good garden soil. Plant in large clumps and leave in same pot for several years. Small bulbs should be planted 2 in. deep, and larger bulbs rather deeper, allowing from 2 to 4 in. between the bulbs. Time to plant, Aug. to Nov. The bulbs should be lifted every third year, sorted and replanted. *Increase:* By seeds sown in light sandy soil in boxes in cold frames in September.

GRASSES, ORNAMENTAL. — These plants can be used with good effect amongst border flowers, to provide contrast and prevent colour-clashing. They are also ideal for arranging with flowers in vases, and when dried can be used for indoor decoration.

To dry grasses, cut the spikes just before the seeds are ripe, and tie them loosely in bundles, hang upside down in a cool place for a few weeks. Nearly all the popular grasses are hardy annuals and can be raised from seed sown out of doors in spring. All will grow in ordinary garden soil.

Agrostis (Cloud Grass).—Hardy annual, growing about 1½ ft. high.

Aira (Hair Grass).—Hardy perennials which may be raised from seed sown in April. The foliage is fine and hair-like and the plants bear graceful spikes of flowers.

Avena (Animated Oat).—Hardy annual. Has long extensions to the grains. The grains are sometimes glued to cardboard to act as weather indicators. The extensions curl when rain may be expected.

Briza (Quaking Grass).—Hardy annual. Dainty grasses with purple-coloured seed pods which shake in the slightest breeze. *Briza maxima* grows 1½ ft. high and is altogether more decorative than the species *media*, which is the commoner form. Both are useful when dried.

Bromus (Greek Oat).—Biennial. Similar in appearance to Quaking Grass. Sow in the mixed flower border in July, and the conspicuous flower panicles will be borne on plants 2 ft. high the following summer.

Coix (Job's Tears).—Half-hardy annual. Sow in heat in February or in the border in April. Grows 2 ft. high and produces plumes which last well when dried. The plant originally came from India, and there is a variegated form.

Dactylis (Gardener's Garters).—Perennial. May be raised from seed or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

propagated by division. The rather coarse-growing variegated leaves are effective in the herbaceous border. Flowers of a silvery colour are borne in June and July. There are two varieties, *glomerata* and *glomerata variegata*. The latter is a dwarf form.

Eragrostis (Love Grass).—Hardy annual. Bears light feathery flower spikes, which may be gathered in July for drying.

Eulalia (Zebra-striped Grass).—Hardy perennial. Suitable for growing in a clump as a lawn specimen, 6-8 ft. high. The leaves are long and narrow, often variegated, and the plant bears brownish-violet flower spikes which have silky hairs at the base.

Hordeum (Squirrel's Tail Grass).—Annual. Will thrive in a dry position. *H. jubatum* is most commonly grown variety.

Lagurus (Hare's Tail Grass).—Annual. Bears soft, white, elongated inflorescences, and is very decorative for vases. Grows 1 ft. high.

Panicum (Panick Grass). — Perennials and some hardy and half-hardy annual species. Annual species, *P. capillare*. Perennial species, *P. bulbosum*. Should be cut in July or August for drying.

Pennisetum (Feather Grass). — Half-hardy annual. Produces downy plumes 6 in. long in August. If sown under glass in March the plants may be planted out in May.

Stipa (Feather Grass). — Hardy herbaceous perennial. Increased by division in spring or by seed sown in a cold greenhouse in February and planted out in April. The dainty, feathery inflorescences are valuable for indoor decoration.

Zea (Maize, Indian Corn).—Half-hardy annuals. Grow 3-5 ft. high and are often used to relieve formal bedding schemes. Sow seed in April in heat, and plant out in June. *Z. japonica variegata*, green and white. *Z. gigantea quadricolor*, striped.

GREENHOUSE.—Whatever the size of the greenhouse, great pleasure can be obtained in growing plants for decoration or for cut flowers out of season. With a little care and attention to ventilation and watering, and by studying the individual requirements of plants, quite good results may be obtained.

Ventilation should be given at all times when outside weather conditions are favourable. For this purpose hinged lights or ventilators are provided at the top and sometimes sides. Always open ventilators on the side away from the prevalent winds. Never open any light so as to cause a draught, or considerable damage may be done. If the ventilators are closed one hour before sunset it will conserve the heat generated by the sun during the day and so secure a higher temperature through the night.

The temperature of the house must receive careful attention, sudden changes being very harmful. The gradual opening and closing of the ventilators according to the sun will help to keep an even or level temperature. The winter night temperatures of the various houses are as follows: stove, 60°-65°; warm house or intermediate house, 50°-60°; cool house, 45°-50°. In the cold house a few sheets of brown paper covered over the plants will protect them from several degrees of frost.

Watering.—Many plants are killed annually by careless watering. It is a good rule never to water a plant unless it needs it. The best test of dryness is to tap each pot separately; a dry pot will give a hollow, bell-like sound, and those that are wet enough will sound dull and heavy.

The cold or unheated house.—This is often the amateur's first small structure, but in it quite a good selection of plants may be grown. A study of alpines, bulbs, annuals and herbaceous plants, and a few shrubs and hardy ferns will give a wonderful and lasting display.

The cool house, or the house with a small heating apparatus that will provide a night temperature not lower than 45°.—This is probably the most useful of all of the range of houses, as in it not only can a large selection of plants be grown all the year round, but many other plants can be grown for bedding and outside decoration.

The warm or intermediate house.—This is a house for the more ambitious, and a night temperature of at least 50° must be maintained. In it can be grown a wonderful array of choice flowering and foliage plants and quite a number of sub-tropical species.

The stove house.—This is the luxury house, and is only to be found on very large private estates. It demands a night temperature of 60°. The plants chiefly grown are from the tropics and need a humid atmosphere.

GREEN MANURING.—This is only used, as a rule, when stable manure is unobtainable, or if the user objects to stable manure. It is very useful where wireworm is a nuisance. Mustard at the rate of two ounces per rod, with half an ounce of rape, mixed and sown in summer after early potatoes, peas or broad beans is the best. It is wise, however, to supplement with chemical fertilizers if green manure is used.

GREVILLEA (Proteaceæ). — Hardy evergreen shrub with ornamental foliage. Good for mixing with other plants in a greenhouse and also for room decoration. It is not quite hardy and should be pre-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tected in cold weather. *Soil:* Loam and peat, with a lot of sand. Position, well-drained pots in airy greenhouse, window or room. Pot in spring. Prune occasionally to induce shapely growth. *Increase:* By seed sown ¼ in. deep, in a temperature of 75°-80° in March. Also by cuttings of shoots 3 in. long with small heel of old wood attached.

GRIFFINIA (Amaryllidaceæ). — Evergreen bulbous stove plants. *Soil:* Compost of two parts fibrous loam, one part peat, with a little dried leaf mould. Position, well-drained pots on a bed with bottom heat, with a temperature of 85° in plant stove. *Increase:* By seeds sown just below the surface of the soil in February or March.

GRINDELIA, Gum Plant (Compositæ).—Mostly perennial plants. *Soil:* Ordinary garden soil in full sunshine. *Increase:* By seeds sown in heat in early spring, also by division at planting time.

GRISELINIA (Cornaceæ). — An evergreen shrub with leathery leaves. *Soil:* Preferably fertile, but will do well in any rich light soil. *Increase:* By seeds, and also by layers in late summer.

GUANO. — Bird droppings containing nitrogen and phosphates. Used as fertilizer.

GUELDER ROSE.—*See* VIBURNUM.

GUERNSEY LILY.—*See* NERINE.

GUNNERA (Haloragaceæ).—Hardy herbaceous perennial with large leaves 4-6 ft. in diameter. Small flowers. *Soil:* Ordinary rich garden soil. Damp, sunny position in sheltered margins of ponds or bogs. Plant early spring. Protect in winter and mulch annually. *Increase:* By seeds sown just below the surface of the soil in pans, in a temperature of 55°-65° in March. Transplant outdoors in March.

GYPSOPHILA, Chalk Plant (Caryophyllaceæ).—Showy plants for rockwork or mixed border. Hardy perennials that may spread into a broad bush and bear numerous sprays of lace-like blooms. *Soil:* Ordinary garden soil, mixed with old mortar rubble. Plant in autumn and spring. Cut down flower stems in October. *Increase:* Annual species, by seeds sown in April on surface of soil where plants are to flower. Perennial species, by seeds sown in sunny position outdoors in April, transplanted into permanent position in summer.

H

HABERLEA (Gesneraceæ). — Herbaceous perennials suitable for the rockery or for edging. *Soil:* Peaty, in a shady position, slightly sheltered in winter. *Increase:* By division in spring or autumn, or by seeds sown in sandy peat when ripe.

HABLITZIA (Chenopodiaceæ).—Hardy herbaceous climbing plants. *Soil:* Ordinary. Cut down to the ground in October. *Increase:* By seeds sown in spring, or by division in autumn or spring.

HÆMANTHUS (Amaryllidaceæ).—Deciduous bulbous plants, cultivated in the greenhouse. *Soil:* Two parts loam, one part peat, half part sand. Minimum temperature, 50°. *Increase:* By seeds or offsets.

HA-HA.—Where a view is obstructed by a wall or fence, a ditch is sometimes made as a boundary line. This is termed a "Ha-Ha" boundary.

HALF-HARDY ANNUALS. — Half-hardy annuals are too tender to stand the winter out of doors. They should be sown in February or March in the greenhouse or cold frame and planted out as bedding plants. In most cases, however, good results are obtained by sowing the seed in the open in May.

A compost of two parts loam, one part peat and one part sand is excellent for the seed boxes. Some of the best-known half-hardy annuals are: China Asters, Ten Week Stocks, Petunias, Cosmea, Salpiglossis, Zinnias.

HALF-HARDY BIENNIALS and **HALF-HARDY PERENNIALS** are plants that are only suitable for outdoor culture during the summer in the British climate.

HAMAMELIS, Witch Hazel (Hamamelidaceæ).—Deciduous shrubs and trees. The red or yellow flowers of *Hamamelis virginiana* open before the leaves develop. *Soil:* Loam, peat and leaf mould in a moist, well-drained position. Thin out the branches in April if necessary. *Increase:* By seeds, layering or grafting.

HEATHER, *Erica* (Ericaceæ).—*See also* CALLUNA and DABŒCIA. Large genus of evergreen shrubs varying in height from semi-prostrate species up to 20 ft. For the most part they will not grow in soil that contains lime, but a few species will succeed in chalky soil. The ideal soil for most heathers is light sandy peat, not too rich. *Increase:* By seeds sown in sandy peat in spring, or by cuttings. The best time to take cuttings is from April to June in the case of *Erica carnea*, and early August in the case of other species. *E. carnea* is the variety commonly grown in pots for the greenhouse and room decoration.

BEST TO GROW.—*E. arborea*, the "Tree Heath," 6-15 ft., white fragrant flowers in March and April; it is from the roots of this plant that "briar" pipes are made, the French name for the plant being Bruyère. *E. carnea*, 6-10 in., rosy-red flowers from February to April; specially suitable for pot culture, and often forced for winter decoration. Plants purchased in pots in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

full bloom may be safely moved to the garden for the summer months, where they will usually establish themselves as permanent inhabitants. This is one of the species which will tolerate the presence of lime in the soil. When grown in the greenhouse, Ericas should be kept uniformly moist in the pots and the pots should be plunged in a bed of ashes during the summer. Minimum temperature, 36°.

HEDERA, Ivy (Araliaceæ).—Evergreen climbers, suitable for covering house walls, old tree trunks, etc. *Soil:* Ivies will grow almost anywhere, but the variegated varieties are always best grown in rather poor soil. This brings out the variegation. Plant in spring, or if the plants are grown in pots they may be put out at any time. *Increase:* By root cuttings in summer. These should be put in the shade, and if the cuttings are weak, they should be cut down to the ground after the first year.

HEDGES.—Living hedges are much more beautiful than the wooden fence or brick wall, and this method of making boundaries is becoming more and more popular.

There is ample scope for originality in this section of the garden. The formal privet, which has been much "overdone," can be entirely abolished in favour of more decorative shrubs. For a boundary hedge, it will be necessary to grow dense shrubs of quick growth, and this type of hedge is usually kept to a formal design. The method of planting a hedge is the same as planting individual shrubs. If the hedge is to be very formal it will need continuous clipping during the summer months.

The following shrubs are sometimes used for hedges: Ceanothus, Cistus, *Cotoneaster Simonsii* (for seaside gardens), *Cydonia japonica*, *C. Maulei*, Cypress, Erica, Escallonia (seaside gardens), Fuchsia, Hydrangea, *Juniperus communis*, Lavender, Lilacs, *Olearia Haastii*, *O. macrodonta*, *Philadelphus microphyllus*, *Prunus Pissardii*, Rhododendron, Rosemary, *Spiræa Thunbergii*, Veronica.

HEDYCHIUM (Scitaminaceæ).—Greenhouse herbaceous perennials. *Soil:* Two parts peat, one part loam and one part sand. Minimum temperature, 45°. *Increase:* By root division in spring. Give plenty of light and water during growing period. Weak doses of liquid manure will also be appreciated. *H. Gardnerianum* can, in very mild localities, be grown in the open during the summer months. This is the only species which is popularly grown in Britain.

HEDYSARUM (Leguminosæ).—Hardy biennials and perennials suitable for the border and for the rock garden. *Soil:* Ordinary, in a sunny, well-drained position. *Increase:* By seeds or division in autumn or spring.

HELENIUM (Compositæ).—Hardy herbaceous perennials useful in the border and as cut flowers. *Soil:* Ordinary, in a sunny position. Plant from November to March, staking the tall varieties. *Increase:* By division in spring or by division at planting time.

HELIANTHEMUM (Cistaceæ).—Hardy evergreen shrubs, very suitable for growing in the rock garden. *Soil:* Light, sandy in a sunny position. Prune into shape in March. *Increase:* By division, cuttings and seeds in autumn or spring.

BEST TO GROW.—*H. alpestre*, dwarf, yellow flowers and silvery leaves, height 3-5 in. *H. halimifolium*, bright yellow, 2-4 ft. *H. lunulatum*, yellow with red spot at base of each petal, dwarf, suitable for the rock garden. *H. vulgare*, very hardy, yellow, May to July.

HELIANTHUS, Sunflower (Compositæ).—Hardy annuals and perennials. *Soil:* Ordinary, in a sunny position. *Increase:* By root division in autumn or spring, or by seeds in spring or summer. As the roots spread very rapidly, the plants should be lifted and divided every year or two.

See also ARTICHOKE, JERUSALEM.

HELICHRYSUM (Compositæ).—Hardy annuals and perennials. *See* EVERLASTING FLOWERS.

HELIOPHILA (Cruciferæ). — Half-hardy annuals cultivated in the cool greenhouse. Sometimes used for summer bedding. *Soil:* Loam, leaf mould and sand, with a little complete fertilizer added. *Increase:* By seeds. The flowers are sky-blue with a white eye, appearing in June and July. Height 1-1½ ft.

HELIOPSIS (Compositæ).—Hardy annuals and perennials, although the annuals are seldom grown. *Soil:* Ordinary, in a sunny position. *Increase:* By seed and division.

HELIOTROPIUM (Boraginaceæ).—Soft-wooded, evergreen flowering shrub, suitable for greenhouse culture, or summer bedding. *Soil:* Light, rich. Minimum temperature, 40°. *Increase:* By cuttings taken in February or August.

HELLEBORUS, Christmas Rose (Ranunculaceæ).—Hardy perennials which bloom in the open garden in winter and early spring. Excellent as cut flowers. If the stems are split they will last for several weeks in water. *Soil:* Moist, rich in a sunny position. *Increase:* Seeds, or division in spring. Hellebores can also be grown in pots and in cool greenhouse, when they will flower in early winter. These plants are poisonous, and should not be grown on any account near the children's garden.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

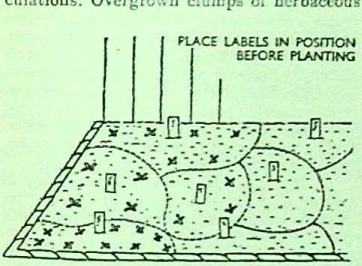
Digitized by Arya Samaj Foundation Chennai and eGangotri

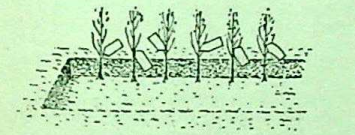
HELXINE (Urticaceæ). — A creeping perennial, excellent as a carpet plant, and for growing on damp walls. This plant grows very freely, and if allowed to grow unchecked it will soon become a weed.

HEMEROCALLIS (Liliaceæ).—Hardy herbaceous perennials, useful in the border and bog garden. *Soil:* Light loam, in a sunny position, and with plenty of moisture. *Increase:* By division of the roots in March, or by seeds sown in spring.

HEMP, INDIAN.—*See* CANNABIS.

HERBACEOUS BORDER. — Hardy perennials are usually the chief features of the herbaceous border. The advantage of this type of border is that it can be left undisturbed for four or five years, and with careful arranging the border can have plants in flower during every month of the year. To obtain a good display, and to avoid patchiness, the plants should be arranged in groups of three or more, according to the size of the border, planting the taller kinds at the back of the border. To break the monotony, however, a tall-growing perennial can be brought to the foreground here and there. When planting, the easiest thing to do is to make labels for each group of plants, and to set these in position where the plants are to be placed. This avoids trouble from miscalculations. Overgrown clumps of herbaceous flowers always send up more shoots than are desirable, and in the case of Michaelmas Daisies and similar plants, these should be thinned in early summer so that each stem can develop symmetrically.





PLANTING
FLOWER
BORDERS

Labels of the herbaceous plants to be planted should be spaced out in the border as shown above before the planting begins

HERB GARDENS.—In every garden some herbs should be grown. If the garden is large enough, a special portion might be set aside for their cultivation. There is no reason why this special portion should be purely utilitarian; in fact, a small herb garden can be designed on old-world lines, and form a pleasing link between, say, the flower garden and the vegetable plot.

Herbs to be grown annually from seed: Angelica, sow in March, in shady position; *Anise (Pimpinella anisum)*, sow in April, sun; *Basil*, April, sun, half-hardy; *Borage*, March, sun; *Caraway*, April, sun or semi-shade; *Chervil*, March to October, shade, sun for winter crop; *Coriander*, March or September sun; *Dill*, April, semi-shade; *Fennel, Sweet*, spring and autumn, sun; *Finnochia*, April or September; *Mercury* (French), March; *Parsley*, April and summer, sun or shade; *Pot Marigold*, March and August, sun; *Purslane*, April to August, sun; *Savory*, summer, April, sun; *Tansy*, spring, sun.

Perennial Herbs: Balm, spring or autumn; *Chives*, March, 6 in. apart; *Fennel, Bitter*, sow in summer; *Garlic*, plant in February or March 6-9 in. apart; *Horse Radish*, plant February, well-trenched soil; *Mint*, plant February or March, moist soil; *Pennyroyal*, sow in moist sandy loam, spring; *Savory, Winter*, sow in April; *Tarragon*, plant in April, sun; *Marjoram*, sow in April.

HESPERANTHA (Iridaceæ).—Greenhouse bulbs with flowers that open in the evening. *Soil:* Four parts loam, two parts peat, one sand. Pot in November. *Increase:* By offsets.

HESPERIS, Sweet Rocket (Cruciferæ).—Fragrant hardy perennials and biennials, useful for the mixed border or the rock garden. *Soil:* Ordinary preferably light. *Increase:* By seeds or by division of the crowns in the case of perennials.

HEUCHERA (Saxifragaceæ). — Hardy perennials useful for the border, or for edgings, and also for the rock garden. *Soil:* Medium or light in full sunshine. *Increase:* By seeds and also by division of the crowns in spring. These divisions should be sheltered in a nursery bed of open sandy soil for a year after division.

HIBISCUS (Malvaceæ).—Hardy and tender annuals and perennials. *Soil:* Light rich loam. For the stove species, fibrous peat and loam with some charcoal and sand. Pot or plant in February or March. Prune shrubs in February. *Increase:* Annuals by seeds, stove species by seeds.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

perennials by seeds or division, shrubs by cuttings or grafting.

HICKORY.—*See* CARYA.

HIERACIUM, Hawkweed (Compositæ). — Hardy herbaceous perennials with yellow flowers suitable only for the wild garden. Height 18 in. *Increase:* By seeds or division.

HIPPOPHÆ (Elæagnaceæ). — Deciduous, berry-bearing shrub. *Soil:* Ordinary. *Increase:* By suckers, layers, or root cuttings.

HOFFMANNIA (Rubiaceæ). — Stove perennials or shrubs with various-coloured flowers and very ornamental foliage. *Soil:* Two parts loam, one leaf mould, and some sand. *Increase:* By cuttings.

HOLBŒLLIA (Lardizabalaceæ). — Evergreen climbers with scented flowers. *Soil:* Sandy. *Increase:* By cuttings.

HOLLY, *Ilex* (Aquifoliaceæ).—A large genus of deciduous and evergreen shrubs, grown for their glossy foliage and berries. The flowers appear during May to August. Good hedge plants. *Soil:* Well-drained loam, in sun or shade. Prune with secateurs in April. *Increase:* By seeds or cuttings.

HOLLYHOCK, *Althæa rosea* (Malvaceæ).—Hardy border perennials that are most satisfactorily grown as annuals or biennials, as young plants suffer less from the dreaded Hollyhock Rust. *Soil:* Deep loam with plenty of liquid manure. *Increase:* By seeds, or by offshoots from the base. A good strain of seed now gives a large percentage of doubles, true also to colour.

HOLLYHOCK RUST. — Yellowish brown areas on foliage and stem, due to a fungus disease. Cannot be satisfactorily controlled.

HONESTY, *Lunaria* (Cruciferæ).—*Soil:* Moist, rich, position shady. *Increase:* By seeds sown in May. Plant in flowering quarters in April.

Cut when fully ripe and store dry for a few days before rubbing off the outer cases of the seed pods, to show the silver "moons."

HONEYSUCKLE.—*See* LONICERA.

HOP.—*See* HUMULUS.

HORDEUM, Squirrel Tail Grass.—*See* GRASSES

HORMINUM, Pyrenean Clary (Labiatæ).—Hardy tufted perennial with purple-blue flowers suitable for the rock garden. *Soil:* Warm, dry. *Increase:* By seeds or division.

HORNBEAM.—*See* CARPINUS.

HORNED POPPY.—*See* GLAUCIUM.

HORSE CHESTNUT.—*See* CHESTNUT.

HOTBED.—The name given to the heap of fresh manure which forms the foundation for a frame, heat being generated by the manure as it decomposes, so that the temperature in the frame is kept above the normal.

To make a hotbed, procure fresh stable manure, containing a percentage of strawy litter. Two loads are sufficient for a single light frame. Dry grass or leaves can be used with the manure.

Stack it in a heap, and turn it every three days so that the inside of the heap is exposed to the air each time. Make up a bed after three or four turnings, building it the shape of the frame but a little wider and longer. Stand the frame over it, and cover the manure with a layer of fine soil, about 4 in. deep. Do not use the frame until a stick, thrust into the heap, and then withdrawn after a few minutes, can be grasped comfortably in the hand. The heat of such a bed lasts for about two months, after which it can be kept up by stacking fresh manure round the sides, though this may be unnecessary if the days are lengthening and the sun's rays are becoming warmer.

HOULLETIA.—Stove epiphytal orchids. For cultivation *see* ORCHIDS.

HOUSELEEK.—*See* SEMPERVIVUM.

HOWEA (Palmæ).—Stove palms that are largely grown for house decoration under the name "Kentia."

HUMEA, Incense Plant (Compositae).—Greenhouse, biennials with scented foliage, and graceful racemes of rosy-purple flowers. *Soil:* Rich loam, with old crumbly manure, leaf mould, sand and bonemeal. *Increase:* By seeds sown in early spring or summer.

HUMULUS, Hop (Urticaceæ).—Twining annuals and perennials of rapid growth. Useful for trellis or pergolas. *Soil:* Deep, rich. *Increase:* By seeds, perennials by division in spring.

HUMUS.—Dead vegetable or animal matter that is decaying in the soil. Its presence helps to retain moisture, and therefore plant food.

HUNNEMANNIA, The Mexican Poppy (Papaveraceæ).—*Soil:* Warm, well cultivated. *Increase:* By seeds sown outdoors in May or June, protecting the plants in winter. Or sow under glass in March and plant out in May. Will flower the same season.

HUTCHINSIA (Cruciferæ). — Hardy perennials. *Soil:* Light, sandy, on a sunny rockery. *Increase:* By seeds in spring.

H. alpina is the only species grown, and resembles a miniature candytuft.

HYACINTHUS, Hyacinth (Liliaceæ).—Hardy bulbs suitable for indoor and outdoor cultivation and for almost any position. Hyacinths are the most popular of all bulbs for growing indoors and would undoubtedly be grown far more in small gardens were it not for the fact that they are rather more expensive than daffodils and tulips. Also,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hyacinths deteriorate more rapidly in the soil of British gardens than do daffodils and other spring flowers that are natives of Great Britain. *Soil:* For outdoor cultivation, ordinary. Preferably rather light. For ease in planting, remove three or four inches of top soil, fork the undersoil deeply, incorporating some very well-decayed manure or bonemeal at the same time. Then set the bulbs out in position 8-12 in. apart, pressing the base of the bulbs on to the soil and replace the topsoil over all. If the natural soil is heavy, add sand when the underlayer is being prepared. An alternative method of planting is to set the bulbs out on the surface of the soil and then use a dibber. A little sand spread over the surface of heavy soil will trickle into each hole as it is made and prevent the collection of water at the base of the bulb. *Soil for indoor cultivation:* Light sandy loam, or, if preferred, the bulbs can be grown in bowls of coconut fibre without drainage. (*See* BULBS.) The time to plant Hyacinths is as soon as they are obtainable, about September, but bulbs may be planted in October if more convenient.

BEST TO GROW.—Of the ordinary named varieties of Hyacinths, the following are recommended: *White:* "Arentine Arendsen," "Queen of the Whites," "La Grandesse." *Blue:* "Duke of Westminster," "Bismarck," "King of the Blues," "Schotel." *Pink:* "Beauty," "Lady Derby," "La Victoire." *Purple:* "Distinction," "Lord Balfour." *Yellow:* "Yellow Hammer," "Prince Henry," "Oranje Boven."

For outdoor cultivation.—Hyacinths recommended for bedding are: "Arentine Arendsen," white; "City of Haarlem," yellow; "General de Wet," pink and rose; "Gertrude" (deteriorates less than most), pink and rose; "Grand Maitre," blue; "King of the Blues," blue; "Oranje Boven," orange; "Perle Brillante," blue; "Queen of the Pinks," pink; "Queen of the Whites," white; "Schotel," blue; "Yellow Hammer," yellow.

HYDRANGEA (Saxifragaceæ).—Greenhouse and hardy flowering shrubs. *Soil:* Well-cultivated soil containing plenty of humus and sand. Hydrangeas like a good deal of moisture. The colour of the common *Hydrangea hortensis* varies according to the soil in which it is grown, and where it is desired to change the colour from pink (the most common) to blue, special blueing powders are used. These are sold by all nurseries and should be used in accordance with the instructions. For pot cultivation use a compost of two parts loam, one part peat, and one part leaf mould for the first potting, with soil of a little stiffer texture [illegible] loam and sand for the final potting. *Increase:* By cuttings, taken in February or March, or in autumn, and keep the plants in a house from which frost is excluded. The hardier Hydrangeas can be grown outdoors all the year, while the more tender ones can, if liked, be used for bedding out during the summer, or the pots can be sunk in the border for the summer months. Forced Hydrangeas bought in pots at a florist's, already in flower, should, when the flowers fade, be kept indoors away from frosts until the summer commences. They can then be sunk in a sheltered border for the summer months, lifted and brought indoors again for the winter. Shoots that have flowered can be cut back a little to make the bushes shapely, but do not prune heavily, as the growths from the shoots that have not flowered and have not been cut back will provide the largest trusses of bloom.

HYMENOCALLIS (Amaryllidaceæ).—Stove, greenhouse, and half-hardy bulbous-rooted plants. *Soil:* Rich sandy loam. The tender kinds must be kept moist all through the year. During the summer months the hardier species may be planted in the open ground, but must be taken up at the approach of the frosts and stored in dry sand. *Increase:* By seeds or offsets removed at potting time.

HYPERICUM (Hypericaceæ).—Deciduous and evergreen hardy and half-hardy shrubs Some species are suitable for growing in the rock garden. *Soil:* Ordinary. *Increase:* Seeds, division or cuttings.

I

IBERIS.—*See* CANDYTUFT.

ILEX.—*See* HOLLY.

INDIGOFERA, Indigo (Leguminosæ).—Deciduous shrubs with ornamental foliage, for greenhouse and outdoor culture. *Soil:* For outdoor species, ordinary, in full sun. For greenhouse species, a compost of turfy loam, leaf mould and sand. *Increase:* by seeds and cuttings.

INSECTIVOROUS PLANTS.—Plants that trap insects for food, often by some sticky portion, such as the leaves. When a fly or other insect settles on the leaf, it is held captive and decomposes, after which the plant can absorb it. This type of plant prefers a moist site—the bog garden or a moist situation in the greenhouse.

INULA (Compositæ).—Hardy herbaceous plants suitable for the wild garden, the border, or even the rock garden. *Soil:* They will grow in almost any soil. *Increase:* By root division in spring.

IONOPSIDIUM, Violet Cress (Cruciferæ).—Hardy annual, suitable for the [illegible] ordinary,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but not too light, in shady spot. *Increase:* By seeds.

IPOMŒA (Convolvulaceæ). — Woody twining plants. Morning-glory (mainly *I. purpurea*) belongs to this genus. Ornamental for trellis and fence, in various shades of blue.

IRIS (Iridaceæ). — Hardy bulbs and tuberous-rooted perennials. The bulbous-rooted irises, also the winter-flowering irises such as *I. alata* and *I. tingitana*. *Cultivation of bulbous-rooted species:* Ordinary soil, or light and open, with leaf mould. Plant the bulbs about 3 in. deep and 6 in. apart in September. In pots treat like spring bulbs, but do not force unduly. *Cultivation of tuberous-rooted species:* Ordinary, well-dug soil, with plenty of lime. Plant in early autumn, letting the rhizomes lie on the surface so that they are sun-baked. The fibrous roots will be covered with soil. The common purple flag belongs to this group. *Cultivation of beardless irises:* This group includes *Iris sibirica* and the winter-flowering *I. unguicularis* (or *stylosa*), which blooms in midwinter. *Soil:* Rather heavy, with peat if possible. *I. unguicularis* appreciates a top dressing of gravel. Some of the water-side irises are in this group, and for these a position in moist soil on the margin of ponds should be chosen. Plant in October or March. *Cultivation of cushion irises:* Light, rich loam with plenty of mortar rubble, in a bed against a south wall, or a very warm part of the rockery. Plant in October and protect with cloches during the winter. Lift in July and store the roots in dry sand in a warm shed or greenhouse, until replanting time. *Increase:* All irises from seeds sown in sandy soil in a cold frame as soon as ripe, or by offsets in the case of the bulbous species, and the division of the tuberous-rooted perennials.

IVY.—*See* HEDERA.

IXIA (Iridaceæ). — Half-hardy bulbs. *Soil:* Rather light. Pot up in October and keep in a cold pit until the roots have formed, when they can be moved to the greenhouse. These bulbs can also be grown outdoors, in a warm, sunny border that is well drained. *Increase:* By seeds sown in spring, or by offsets.

IXIOLIRION (Amaryllidaceæ).—Nearly hardy bulbs. *Soil:* Warm, and well cultivated, preferably with some leaf mould and sand. Plant in autumn 2 in. deep and protect with a mulch of litter during the winter, which will be removed in spring. *Increase:* By seeds or offsets.

IXORA (Rubiaceæ).—Stove evergreens. *Soil:* Two parts loam, two parts peat, one part leaf mould and some silver sand. Prune and repot at the end of March. *Increase:* By cuttings of young shoots.

J

JABOROSA (Solanaceæ).—Herbaceous perennials, with white flowers. Height 1 ft. *Soil:* Well-drained, sandy loam. *Increase:* By division or cuttings.

JACARANDA (Bignoniaceæ).—Mimosa-leaved Ebony tree. Stove evergreen. *Soil:* Two parts sandy peat, and one part fibrous loam. Pot and prune in spring. Winter temperature 55°. *Increase:* By cuttings.

JACOBINIA (Acanthaceæ). — Stove shrubs, allied to Justicia. *Soil:* Loam, peat and leaf mould with a little dried cow manure and sand. *Increase:* By cuttings.

JAPANESE GARDENS. — Formal or landscape gardens usually constructed in miniature, and containing certain definite features such as wells, water-basins, lanterns, stepping-stones, etc., etc. Small shrubs and pine trees of dwarf stature are chiefly used for the planting of Japanese gardens.

Flowering plants are not used to any great extent, though miniature rock plants, water reeds and irises can be introduced in association with the rocks and water.

JASMINE, *Jasminum* (Oleaceæ).—Deciduous and evergreen climbers and shrubs. *Soil:* Good, rich loam. Plant from October to March. Prune after flowering. *Increase:* By cuttings or layers.

JUDAS TREE.—*See* CERCIS.

JUGLANS.—*See* WALNUT.

JUNIPER.—*See* CONIFERS.

JUSTICIA (Acanthaceæ).—Stove flowering and ornamental foliage plants. *Soil:* Equal parts loam, peat and sand, repot in spring Prune after flowering. Minimum temperature, 65°. *Increase:* By cuttings in spring.

K

KADSURA (Magnoliaceæ). — Climbing evergreens. Rather tender, and requiring the shelter of a warm wall. *Soil:* Loam with peat. *Increase:* By cuttings.

KÆMPFERIA (Scitaminaceæ).—Stove herbaceous perennials, with fragrant flowers and leaves flaked with white above and purple beneath. *Soil:* Two parts loam, one part peat, half part sharp sand. *Increase:* By division.

KAINIT. — Soluble potash fertilizer, suitable for use on any soil for fruit and vegetables. Applied at the rate of two and a half pounds per square rod. *See also* FERTILIZERS.

KALE.—*See* BORECOLE.

KALMIA (Ericaceæ). — Evergreen shrubs, the foliage of which is said to be poisonous to animals. *Soil:* Peaty, or loam and leaf mould with no lime. *Increase:* By cuttings, or alternatively by seeds or layers.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

KEEL.—The lower pair of petals in flowers belonging to the pea family.

KELP.—Seaweed, a useful manure, especially for early potatoes.

KENTISH COBS.—*See* NUTS.

KERRIA (Rosaceæ).—Deciduous shrub with arching branches carrying rich golden-yellow flowers during April and May. *Soil:* Ordinary in a sunny position. *Increase:* By cuttings or division.

KLEINIA (Compositæ). — Greenhouse perennials. *Soil:* Equal parts peat, leaf mould and sand. Repot in spring. Stand in a sunny position. *Increase:* By cuttings, which are best allowed to dry for a few hours before insertion in sandy soil.

KNIPHOFIA, Red Hot Pokers (Liliaceæ).—Hardy herbaceous perennials. *Soil:* Deep, rich, light, in full sunshine, with plenty of water. Tie the leaves together over the crowns for the winter to prevent rain entering and causing damage. *Increase:* By seeds, division or suckers.

KNOT GARDENING. — A form of gardening practised in Tudor times. Intricate designs are worked out in dwarf shrubs or in inanimate materials such as tiles or bricks. The beds between these are filled with old English flowers or, in some cases, merely with coloured sands and pebbles.

KOCHIA, Summer Cypress (Chenopodiaceæ).—Half-hardy annuals, grown for their elegant, finely-cut foliage, which is a light green in summer and turns a beetroot red in autumn. Sow in the cold frame in April. Plant out in June in ordinary soil. Height 3 ft.

KOHL-RABI, *Brassica oleracea caulorapa* (Cruciferæ).—An uncommon vegetable, generally used as a cattle food. It resembles a turnip with leaves growing from its sides. *Soil:* Ordinary, rich. Sow under glass in April, and transplant 18 in. apart.

KOLKWITZIA (Caprifoliaceæ).—Deciduous shrub with pink flowers during May and June. *Soil:* Ordinary, with added peat or leaf mould. *Increase:* By seeds, cuttings or layers.

L

LABELS form an important but often neglected part of the gardener's equipment. All trees, shrubs, plants and especially seedlings should be labelled to avoid confusion of varieties. Metal tabs are now being largely used. Those made of aluminium will take the marking of a lead pencil and if the writing is clear varnished this will last well.

LABOUR SAVING IN THE GARDEN.—Many would-be gardeners are deterred by the thought of [illegible] and the time they would have to spend to obtain satisfactory results. This need not be the case, however, as it is possible so to plan the garden that it will be aesthetically attractive yet require comparatively little time to be spent on it.

Annuals, herbaceous perennials and rare alpines that have a knack of fading away unless carefully watched can be replaced by flowering shrubs. By making a careful choice of these, with an eye to their colour, height and season of greatest beauty, the garden can be gay and colourful all the year round, and if bulbs such as lilies, narcissi, etc., are planted between the shrubs, the sameness of the ensemble is broken up.

It goes without saying that all tools should be of the best quality and in good condition so that no time is lost in using them.

LABURNUM (Leguminosæ). — Hardy deciduous trees that regularly bear pendent racemes of bright yellow flowers; reckoned as amongst the most popular and attractive of trees. *Soil:* Ordinary. Plant in November and prune by cutting out dead wood in winter and cutting back weak wood after flowering. *Increase:* By seed sown out of doors in spring, by budding or grafting in early autumn for the named varieties.

LACHENALIA (Liliaceæ).—Pretty bulbous flowering plants for the cool greenhouse. *Soil:* Pot in autumn in a compost of three parts of loam, with leaf mould and sand. Place six bulbs ½ in. deep in a 5-in. pot or about 1 in. apart in pans or baskets. Keep them in a cold frame and then in the greenhouse in winter. Keep in a sunny position when growth commences and water moderately, gradually increasing the supply. Give weak liquid manure when the flower spikes are showing. Gradually dry off when the flowers are finished and re-pot annually. *Increase:* By offsets taken when potting.

LACTUCA SATIVA.—*See* LETTUCE.

LANTANA (Verbenaceæ).—Half-hardy and greenhouse evergreen flowering shrubs. *Soil:* A compost of two parts of loam with one part each of peat and well-decayed manure with a little sand. Prune into shape and keep in a light, airy part of the greenhouse. For outdoors, plant in June in rich, light, sandy soil and lift in September. *Increase:* By seeds sown just below the surface in pots of well-drained soil at temperature of 80° in early spring. Also by cuttings taken in autumn and struck in sandy peat under a bell-glass.

LAPAGERIA (Liliaceæ). — Evergreen half-hardy climber regarded as one of the most beautiful of all climbing plants. Leaves, dark green and leathery. Flowers, [illegible] crimson.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Soil: Plant out of doors in moist, well-drained, fairly light soil against a west wall, with a subsoil of clinkers. If long garlands are desired leave the shoots to lengthen, otherwise pinch the shoots when the leaves begin to broaden and the flowers will be borne in numerous clusters. Train the shoots and tie with string rather than wire. Cut back shoots that have flowered and old and dead wood. If in pots, use a compost of three parts of peat with one of loam and one of sand and charcoal. Pot in February or March and train to the walls of the greenhouse. Water freely in summer. *Increase:* By seeds sown in sandy peat at temperature of 60°; by layering, which may take a year to become strong enough to take off from the plant.

LARKSPUR (Ranunculaceæ). — The annual Delphiniums are usually known as Larkspurs. *Soil:* The culture is of the simplest, seed being sown out of doors in spring in fairly rich, well-drained soil. For indoor decoration, sow seeds in boxes in a cold frame in early autumn. Prick out when large enough to handle and pot up in a compost of loam, leaf mould and sand. Pot again later, using a similar compost with mortar rubble to open the soil. Watering should only be done when the plants really need it and then very carefully.

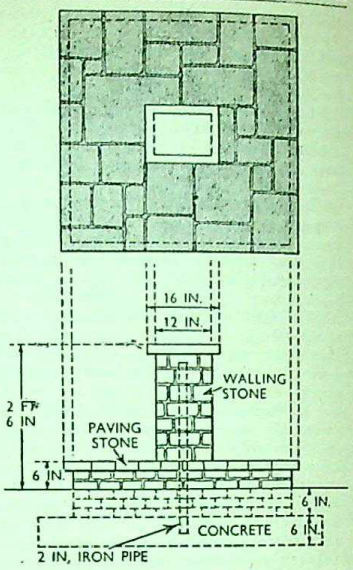
LATHYRUS (Leguminosæ). *See* SWEET PEA.

LAUREL.—*See* PRUNUS.

LAURUS (Lauraceæ).—Hardy evergreen tree with dark green aromatic leaves. The male and female yellow, insignificant flowers are borne on different trees, and are followed by dark purplish berries in October. *Soil:* Ordinary. Plant in spring or in September and prune in April. Often grown in tubs in loam, leaf mould and sand. Keep out of doors in summer. *Increase:* By cuttings in sandy soil in autumn or by layering at the same season.

LAVANDULA, Lavender (Labiatæ).—Evergreen flowering hardy shrubs, highly esteemed for the fragrance of their flowers and greatly used for scent. *Soil:* Light ordinary. Plant in a dry, sunny position in March or September. Prune unshapely plants in March or April. *Increase:* By cuttings of ripe wood taken with a heel and planted in ordinary soil outdoors in September; also by seed sown out of doors in April.

LAVATERA (Malvaceæ). — Hardy annual and flowering shrubs with ornamental foliage. *Soil:* Ordinary. Plant the shrubs in a warm border and the annual in warm, sunny beds or borders. *Increase:* By seeds sown out of doors in April or May, and the shrubby species by cuttings inserted in sandy soil in June and July.



STONE SUNDIAL

A sundial in brick or stone can be made at home, and if made as above will be a welcome change from stereotyped designs

LAWNS.—One of the most attractive features of our gardens may be made in two ways: by laying ready-grown grass in turves on the site marked out for the lawn, or by sowing grass seed. In either case the preliminaries are the same. The general slope of the lawn site must be studied and the ground levelled when it is being thoroughly dug over and prepared. If the soil is heavy some provision for drainage must be made either by laying pipes or by trenching. Prepare the ground in autumn when it can be left open to the action of frost and rain. In spring, rake over and sow a reliable strain of seed, using about two ounces to the square yard. Sow from north to south and from west to east. Rake the seed in and cover with fine soil. If the weather is dry, water in. As soon as the seedlings appear, roll lightly and later cut with a sharp mower. After a few weeks cut every week. Weeds must be removed as they show themselves.

A lawn made from turf is more quickly prepared but is much more costly and rarely free from weeds.

LAWSONIA (Lythraceæ).—A stove tree from the powdered leaves of which henna for dyeing nails, hair, etc., is obtained.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Soil: Sandy peat and turfy loam. *Increase:* By cuttings of ripe shoots inserted in sandy soil.

LAYIA (Compositæ).—Hardy annuals for beds and borders. *Soil:* Ordinary. Sunny position. *Increase:* By seed sown out of doors in April.

LEEKS.—Hardy useful vegetables that have been eaten for many centuries. *Soil:* They may be planted in any soil, but repay generous treatment. The ground should be deeply worked, well manured and well drained, for although they like moisture they hate stagnant water and would suffer from rot. Sow in drills in March for the general crop. Transplant the seedlings in May or June when they are strong enough to handle. Set out in holes 1 ft. apart in rows 1½ ft. apart. Regular hoeings will draw the soil up around the necks of the plants. As they are nearly full grown they are earthed up for another 3 or 4 in. to thoroughly blanch the leaves. They may be left in the ground until required for use. Leeks must be blanched as they grow, either being earthed up continually or covered with a brown-paper collar about 6 in. long, put on the plants when they are quite young and raised as the plants grow. A plank along each side of the bed keeps the earth well mounded up and enables a greater length of blanched leaf to be obtained.

LEIOPHYLLUM (Ericaceæ).—Hardy evergreen flowering shrubs bearing pink or white flowers in early summer. *Soil:* Moist peat and loam or leaf mould, peat and sand. *Increase:* By seeds sown in sandy peat in cold frame in spring, also by cuttings taken in July or August.

LEONOTIS (Labiatæ). — Evergreen flowering shrubs for the cool greenhouse or for a mild position out of doors. *Soil:* In pots use a compost of two parts of rich loam to one each of leaf mould, sand and charcoal. Outdoors plant in rich, sandy loam and protect in winter. Prune after flowering. *Increase:* By cuttings rooted over bottom heat.

LEONTOPODIUM, Edelweiss (Compositæ).—The only species grows in sandy or stony loam amidst rocks, and likes full sunshine. The tiny yellow flowers are produced in May and June. Leaves, greeny-grey. 3 in. Native of the Alps.

LEPTOSIPHON (Polemoniaceæ).—Hardy annuals with dainty flowers set in dark green leaves. *Soil:* Ordinary or sandy loam. *Increase:* By seeds sown in April.

LEPTOSPERMUM (Myrtaceæ).—Early summer-flowering shrubs allied to Myrtles. Except in the mildest districts they require wall protection. *Soil:* Gravelly loam and peat or any soil provided it is not a poor chalky one. *Increase:* By cuttings of ripe shoots in March or by cuttings kept under a bell-glass in May.

LEPTOSYNE (Compositæ). — Hardy annuals and perennials largely grown for cut flowers. *Soil:* Ordinary. Plant the perennials in March or October and the annuals in May or June. *Increase:* By seeds sown in spring or by division for the perennials.

LETTUCE.—One of the most valuable of hardy salad crops. *Soil:* Lettuce grow on any soil but prefer a rich, well-tilled land. Make the first outdoor sowing in March in a warm border in soil that has been well dug and manured at an earlier date. Sow in shallow drills and thin out seedlings as soon as they are showing above the ground. Sow at intervals throughout the summer. Hoe frequently to keep down weeds and if necessary water copiously. Some varieties are self-folding, but it is always best to tie up the leaves with raffia to blanch the heart. Lettuce for the early spring months can be sown in frames or under cloches in October or later. The seedlings are pricked out as soon as possible into light, rich soil. If the soil is moist they will need no further watering.

BEST TO GROW.—The cabbage types are the best for winter and early spring planting as they need less care than the Cos lettuces, while the latter are more valuable for the main crop. Cabbage Type: "Tom Thumb," "All the Year Round." Cos Type: "Hardy White," "Mammoth," "Brown Bath" and "Grey Paris."

LEUCOCORYNE (Liliaceæ). — Half-hardy bulbs with flowers arranged in umbels of from 3 to 7. *Soil:* Pot compost of sandy loam and leaf mould. Place five bulbs in a 5-in. pot and grow on cool. They may be planted out in a warm corner in good loam. Water well while the bulbs are growing but dry them off after flowering. *Increase:* By offsets or by seeds.

LEUCOJUM, Snowflakes (Amaryllidaceæ).—Pretty, hardy bulbs for borders or for naturalizing in woodland. *Soil:* Ordinary, rich. Plant the bulbs 4 in. deep and 3 or 4 in. apart at any time from August to November. They rarely flower the first year and only need replanting every five or six years. *Increase:* By offsets replanted in September or October.

LEUCOPOGON (Epacrideæ). — Evergreen flowering shrubs for the greenhouse. *Soil:* Compost of peat and sand and a little charcoal. Place out of doors in summer. Repot in spring and provide good drainage. Water moderately. *Increase:* By seeds sown as they are ripe in sandy peat at a temperature of 55°. Also by cuttings of ripe shoots.

LEUCOTHOE (Ericaceæ).—Evergreen flowering shrubs for the [illegible] soil: Peat, leaf

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mould and sand. Plant in April or October and leave unpruned. *Increase:* By seeds sown in sandy peat in a cold frame and by layering.

LEWISIA (Portulaceæ).—Hardy perennials for the border or rockery. *Soil:* Light sandy loam in a sunny position. *Increase:* By seeds sown in spring or by division.

LEYCESTERIA (Caprifoliaceæ). — Hardy deciduous shrub having white flowers and small dark berries. *Soil:* Ordinary. *Increase:* By seed. Useful in game coverts as game like the berries.

LIATRIS (Compositæ).—Hardy herbaceous plants for border with spikes of flowers that open from the top downwards. *Soil:* Light, sandy. Plant in March or in autumn in warm districts. Water well during the flowering season. In cold localities lift and store in coke dust until March. *Increase:* By division in March or by seeds sown in light, sandy soil outdoors in August.

LIBERTIA (Iridaceæ). — Hardy and half-hardy perennials useful for the border and the rockery. *Soil:* Fairly dry, light, friable loam. Plant in March or October and protect in winter with leaves or strawy manure. *Increase:* By seeds sown in sandy soil in a frame or by division of the rhizomes in early spring. All the species have whitish flowers and long, sword-shaped leaves.

LIBOCEDRUS (Coniferæ). — Ornamental evergreen trees akin to Thuya. *Soil:* Rich, light, well-drained soil. Cut away dead wood. *Increase:* By seed sown when ripe or by cuttings rooted in a close frame in August.

LIGUSTRUM, Privet (Oleaceæ). — Hardy evergreen and deciduous shrubs with flowers in terminal panicles, round, shiny, black to yellow berries and variegated leaves. *Soil:* Ordinary garden soil. Prune deciduous species in autumn and the rest in April. *Increase:* By cuttings planted in the open in October to November or by seed sown in November, the seedlings being transplanted the following year

LILAC, *Syringa* (Oleaceæ).—Beautiful deciduous hardy flowering shrubs and trees. *Soil:* Grow fairly well in any good garden soil but thrive best in full sun in rich soil. Prune slightly after flowering. As specimens they may be trained in a single stem by removing flower buds and the lower branches. *Increase:* By seeds sown out of doors in warm soil in autumn, by layering or by cuttings of ripe shoots taken in August.

LILIES, *Lilium* (Liliaceæ).—Hardy and half-hardy bulbous plants so numerous that they have been classified according to shape of the flowers and habit of the plants; as trumpet-shaped, cup-shaped, recurved flowers, as lime lovers and lime haters. *Soil:* This should be deeply dug and well drained. Leaf mould should be used but if this is not obtainable use only very old manure as fresh manure is not congenial to them. Most lilies dislike an acid soil containing bog peat. The depth at which to plant varies with the varieties, stem-rooting lilies such as *croceum* and *tigrinum* several inches deep, while those that grow only basal roots may be planted only 4 in. below the surface. Although they are moisture loving, it is a good plan to plant each bulb on a little sand to ward off excessive wet. Swamp lilies are best planted on an inverted flower-pot, and surrounded by sand, as only the roots are meant to enter the mud. Under glass, lilies are usually grown singly in large pots, in good loam, sand and leaf mould, gradually filling up the pot as the stem grows. They may be wintered in a cold frame or in the greenhouse. For forcing, pot up successionally and keep in a temperature of 55°-60°. *Increase:* By offsets taken when re-planting or by seed sown in spring in leaf mould, loam and sand. The soil should be covered with sand to prevent the formation of moss. When the seedlings have two or three leaves transplant into boxes or beds in light loam and leaf mould, in a frame. Small bulbs form, which can be lifted and planted out in permanent quarters the following year.

LILIUM.—*See* LILIES.

LILY OF THE VALLEY, *Convallaria.* —Hardy herbaceous perennials. *Soil:* Outdoors use loam, leaf mould and sand, in shady beds, borders or near walls, fences or trees, where the plants can enjoy a good foot run. Leave undisturbed for several years and mulch annually. In pots use equal parts of loam and leaf mould, with sand to keep the soil open. Place eight to twelve crowns in a 4½-in. pot and stand in a cold frame. Bring into the cool greenhouse from January onwards as needed to have a succession of bloom. Force by planting in bulb fibre and keeping in the greenhouse at a temperature of 50° until the flowers begin to show. Then transfer to a higher temperature, about 70° or 80°. Retarded crowns that force well may be bought. Crowns that have been forced are of little use afterwards and should be planted out to naturalize.

LIME.—Although not strictly speaking a plant food, lime is essential to the well-being of most plants. All plant foods have to assume a certain form before they are available for the plants. Lime helps them to attain this form. It extracts from the plant food certain elements which combine with the lime to form compounds, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

leaves the other constituents free to feed the plants. Therefore, soil that has been much cultivated and manured usually lacks lime. It is also useful in changing the texture of the soil and helps to lighten a stiff, sour soil. Lime may be used in any one of its many forms, and the general method of application is to sprinkle it over the soil, at the rate of 2-4 oz. to the square yard, after digging.

LIME, Linden, *Tilia*.—Stately deciduous trees valuable for forests, for timber, or parks and avenues. Bear whitish fragrant flowers with large bracts. *Soil:* Moist, rich soil in sunny position. *Increase:* By seed sown in the open. Prune when the branches need thinning out.

LINARIA (Scrophulariaceæ). — Hardy annuals and perennials, for borders and rockeries. *Soil:* Ordinary, moist. Sunny position. *Increase:* By seeds for all species and the perennials by division in spring.

LIPPIA (Verbenaceæ). — Deciduous shrub grown on account of its lemon-scented leaves. *Soil:* Loam, leaf mould and sand. Prune hard back when growth is recommencing. Re-pot at the same time or plant out later near a south wall. *Increase:* By cuttings inserted in sandy soil.

LIRIODENDRON (Magnoliaceæ). — Hardy deciduous flowering trees with ornamental leaves. *Soil:* Good rich loam, in sunny, sheltered shrubberies. Prune only to make them a good shape. *Increase:* By seed sown in a frame in May or by grafting in March.

LITHOSPERMUM (Boraginaceæ). — A hardy race of perennials and dwarf evergreen shrubs. *Soil:* Gritty or sandy loam, in sunny position on rockeries or in borders. *Increase:* By seed sown in frames in spring, potted singly later, and grown in frame until the following spring; by cuttings in pots of sandy soil and by layering.

LOBELIA (Lobeliaceæ). — Hardy and half-hardy herbaceous plants for borders and summer bedding. *Soil:* Out-of-doors plant in moist, rich loam, in a sunny position, and the dwarf kinds in light, sandy soil in the rockery. All species are best lifted in autumn and wintered in a cold frame, although the hardier plants may be left in the soil and covered with ashes. For plants in pots, use a compost of loam, leaf mould and sand. *Increase:* To increase by cuttings, pot up the old plants in autumn, put in heat in February and take off the new shoots. Plant these in sandy soil. Sow seed in March in pots or boxes of light, sandy soil. Prick out and pot up singly. Later plant out or transfer to larger pots.

LOMARIA (Filices). — Stove, greenhouse and hardy dwarf or tree ferns. *Soil:* A compost of loam, peat, leaf mould and sand for indoor plants. Pot in February or March. Water abundantly in summer. Syringe frequently. Plant the hardy species in sandy peat, with a little loam and limestone. Water freely.

LOMATIA (Proteaceæ). — Evergreen tender shrubs with feather-like, glossy leaves, glaucous on under surface. *Soil:* Loam, peat and sand in pots, and loam and peat in warm, sheltered corner. *Increase:* By cuttings.

LONICERA, Honeysuckle (Caprifoliaceæ).—Hardy and half-hardy deciduous or evergreen flowering, twining, and climbing shrubs and plants. *Soil:* Ordinary, good, rich loam. Plant in winter and mulch in spring with manure. Prune in February by cutting shoots of previous year's growth. For pot culture use sandy loam, leaf mould and well-decayed manure. *Increase:* By seeds for all species; by cuttings inserted in sandy soil in September and by layering.

LOPEZIA (Onagraceæ). — Tender annual and perennial. *Soil:* Ordinary. *Increase:* By seed sown in the open in May.

LOROPETALUM (Hamamelidaceæ).—Evergreen tender flowering shrub. *Soil:* Peaty or ordinary. Plant in October or later in the winter, in a warm house. Prune into shape after flowering. *Increase:* By seeds sown in sandy soil in a cold frame or by cuttings rooted in a similar medium.

LOTUS (Water Lily). — *See* WATER PLANTS.

LUCULIA (Rubiaceæ). — Evergreen shrubs for the greenhouse or the mildest localities only. *Soil:* Good, rich loam. In pots a compost of equal parts of loam, peat, sand and charcoal. *Increase:* By seeds sown in light soil at a temperature of 60°-70°, but these do not flower for at least three years. Also increase by cuttings inserted in sandy soil in July.

LUFFA (Cucurbitaceæ).—Climbing annual requiring stove culture. *Soil:* Compost of three parts of loam and one of leaf mould. Water plentifully and syringe. When the fruits form give liquid manure. *Increase:* By seeds sown in brisk heat, in a compost of equal parts of loam and leaf mould.

LUPIN, *Lupinus* (Leguminosæ). — Hardy and half-hardy annuals and perennials for beds, borders, rockeries, etc. *Soil:* Ordinary for all species, but if rich so much the better. Mulch the perennials after the first year, in April. *Increase:* By seeds sown where they are to flower. The perennials also by division of the root stock, choosing only strong clumps for replanting.

LYCHNIS (Caryophyllaceæ). — Hardy annuals and perennials for beds and borders. *Soil:* Ordinary or light, rich loam. *Increase:* By seeds sown in the open in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

March or April, in light soil in a sunny position. Also divide the perennials in early spring. Annuals sown in September will flower the following spring.

LYCIUM (Solanaceæ). — Hardy erect and climbing shrubs. *Soil:* Ordinary, well drained. Plant in October, and prune in winter. *Increase:* By cuttings of ripened shoots in ordinary soil. By seeds or by layerings. Can be used for hedges.

LYCORIS (Amaryllidaceæ). — Tender bulbous plants for the cool greenhouse. *Soil:* Two parts of sandy loam and half a part each of leaf mould and cow manure. *Increase:* By seeds or offsets.

LYSIMACHIA (Primulaceæ).—Hardy annual, biennial and perennial plants for shrubberies, borders or wild garden. *Soil:* Ordinary, in any position. *Increase:* By seeds and by division of the perennials.

LYTHRUM (Lythraceæ).—Hardy herbaceous and shrubby perennials. *Soil:* Ordinary, in moist borders. Plant in winter or early spring. Top dress in March and replant every three or four years. *Increase:* By division.

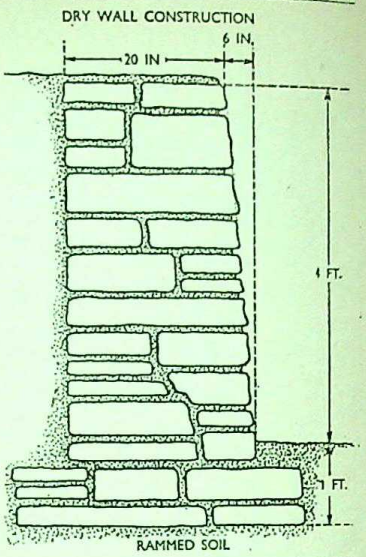
M

MACLEANIA (Vacciniaceæ). — Greenhouse evergreen flowering shrubs, suitable for training over arches and pillars. *Soil:* Pot or plant in a well-drained compost of equal parts turfy loam, peat and sand in March or April. Shorten shoots after flowering. *Increase:* By inserting cuttings in fine sand in summer.

MACROZAMIA (Cycadaceæ). — Greenhouse perennial with thick, leathery leaves, and male and female flowers resembling cones. *Soil:* Well-drained compost of loam and sand, in a light greenhouse. Pot in February or March and water freely in summer. *Increase:* By seeds sown in sandy peat in a temperature of 75°; by division of plants in spring, also by suckers which are occasionally formed.

MADWORT.—*See* ALYSSUM.

MAGNOLIA (Magnoliaceæ).—One of the most beautiful of all spring flowering trees and shrubs, giving a succession of flowers from spring to early summer. Most members of the genus are deciduous. *M. grandiflora*, however, is an evergreen species. *Soil:* Good garden soil, a friable, loamy soil is best, in a dry position. They like to be sheltered from the early morning sun if possible. Plant in spring. No pruning is required. *Increase:* By seeds sown singly under glass, as soon as possible after they have been gathered; by layering in autumn for the more common forms, and by cutting and grafting for the choicer forms. The plants must never be moved while dormant, but may be in spring.



It is advisable with walls over 3 feet in height to have a slight backward tilt.

MAIANTHEMUM (Liliaceæ).—Hardy herbaceous perennial with white flowers in early summer. Suitable for the rock garden or as carpet plants. *Soil:* Ordinary garden soil, fairly fertile. *Increase:* By division in April or September.

MALCOLMIA, Virginian Stock (Cruciferæ).—A hardy annual. Excellent for making a border, or for rockeries and banks. *Soil:* Ordinary good garden soil. *Increase:* By seeds sown in spring. Sow evenly and thinly at any time from March to August, and thin out to 3 in. apart.

MALVA, Mallow (Malvaceæ).—Hardy herbaceous annuals and perennials. *Soil:* Good garden soil. Plant in March or October. *Increase:* By seeds or division in spring for the perennials.

MALVASTRUM (Malvaceæ).—Closely related to Malva. Hardy and greenhouse perennials. The dwarf species are especially suited for the rockery. Protect in severe weather with ashes. *Soil:* Plant in greenhouse in fibrous loam with peat and sand, or out of doors in ordinary soil in full sun. *Increase:* By cuttings under a bell-glass or frame in late summer, also by seeds sown in light, sandy soil.

MANDEVILLA (Apocynaceæ).—Half-hardy climbing shrub with large, white, scented flowers. *Soil:* Plant in peat or leaf-mould and loam, in sunny position. For

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

greenhouse culture plant in February in equal parts of loam and peat with a little sand and charcoal. Prune hard back after flowering. *Increase:* By cuttings of matured shoots during summer. Insert in sandy soil in propagator.

MANDRAGORA, Mandrake (Solanaceæ).—Poisonous to cattle when given by accident with their food. The roots are sometimes sold as cures for certain illnesses. Hardy herbaceous perennials. *Soil:* Ordinary rich garden soil, in shady place. *Increase:* By seeds or division in March.

MANETTIA (Rubiaceæ).—Greenhouse evergreen climber. Excellent for training against pillars. *Soil:* Pot in equal parts of loam, peat and sand in February to March. *Increase:* By cuttings of young shoots taken in spring and struck in sand in heat, or by division of roots.

MAPLE (Aceraceæ).—The Maples are a very lovely genus of shrubs and trees. The shape of the leaves varies in all the forms, some of them being simple and entire, others lobed, while some have compound leaves. The foliage is indeed striking, as it shows rich pink, red and yellow colourings. The flowers are very ornamental, and of red and green colouring. The Japanese species and varieties, the most useful, are unequalled for beauty of colouring and gracefulness; they are most suitable as specimens on lawns, and make attractive pot plants. *Soil:* Maples prefer well-drained loam, but the Scarlet Maple will thrive in damp soils. A stiff, damp soil is bad for the majority. *Increase:* By layering and budding in autumn, and by cuttings in the case of some species. Seeds may be sown out of doors. It is best, however, to purchase young trees.

MARGUERITE. — *See* CHRYSANTHEMUM.

MARIGOLD (Compositæ).—The Scotch or Pot Marigold. Hardy annual for beds, borders and the rockery. *Soil:* Thrives almost anywhere. Seed should be sown in boxes in late winter, the seedlings being pricked out, and planted 2 ft. apart in spring in beds or borders. Seed sown in pots in July will produce flowers for the following Easter. They bud at an early stage and flower as they grow. Large numbers of self-sown seedlings spring up the following year.

MARJORAM (Labiatae). — Woody plant. *Origanum vulgare* and the related species, sweet marjoram (*O. majorana*), are used as pot herbs. Purple-crimson flowers, July-September. Height about 2 ft. *Increase:* By spreading of root-stock.

MATRICARIA (Compositæ). — The hardy annual varieties are the best to grow. The perennials are hardly worth cultivating. *Soil:* Any ordinary garden soil. *Increase:* By seeds, and the perennials by division.

MATTHIOLA.—*See* STOCK.

MECONOPSIS, Himalayan Poppy (Papaveraceæ).—Hardy herbaceous annuals, biennials and perennials. *Soil:* Ordinary good garden soil, but prefer a rich, light, gritty one in a sunny position. All species benefit by occasional doses of liquid manure during the flowering season. *Increase:* The annuals and biennials by seeds, and the perennials by division of roots in March, or seeds sown in a frame in the same month.

MEDINILLA (Melastomaceæ).—Stove evergreen shrubs with hanging bunches of red flowers and leathery foliage. *Soil:* Well-drained garden soil containing good loam and peat and leaf mould. Pot in February and prune into shape in January or February. *Increase:* By cuttings of side shoots taken with a heel in spring. Insert in sandy soil. They are apt to suffer from overpotting so should be kept in quite small pots and re-potted every third year.

MELALEUCA (Myrtaceæ).—An Australian shrub which is only hardy in the mildest localities. *Soil:* Plant or pot in leaf mould, peat and silver sand, in March or April. *Increase:* By cuttings under bell-glass in spring.

MELIANTHUS (Sapindaceæ).—A South African evergreen shrub, with fern-like bluish-green leaves and brown flowers. *Soil:* Ordinary garden soil. Protect in winter or lift and store the roots in pots. *Increase:* By seeds sown in heat during February, and plant out in sheltered position in June.

MELILOTUS (Leguminosæ).—A perennial plant that grows on roadsides and banks and flowers in late summer. *Soil:* Any common soil in a shady position. *Increase:* By seeds sown in spring, or by cuttings.

MELITTIS, Bastard Balm (Labiatæ).—A hardy perennial. *Soil:* Any good garden soil. Plant in spring or autumn. *Increase:* By division of roots after the flowering season is over in early autumn.

MENDELISM. — The principles of heredity deduced from the experimental plant breeding of Gregor Mendel, a nineteenth-century Austrian monk, who was the first to formulate the laws governing the mode of inheritance of certain transmissible characters, and explain hybridization.

MENISPERMUM, Moonseed (Menispermaceæ).—A deciduous climber with peltate leaves. Excellent for training against walls or summerhouses. *Soil:* Any good garden soil. Plant in October or March. Prune weak shoots in winter. *Increase:* By division of roots, or by cuttings in sandy soil during October or March.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MENTHA, Mint (Labiatæ). — Hardy herbaceous perennials. Useful for carpet-plants, although not used so much nowadays as formerly. *Soil:* Plant in moist, sandy soil or stiff, moist loam. *Increase:* By division of the roots in March or by cuttings. The beds should be remade every alternate year and the plants set 9 in. apart.

MENZIESIA (Ericaceæ). — Deciduous shrubs with oval leaves, and bell-shaped flowers in May. *Soil:* Good, peaty soil. *Increase:* By seeds.

MESEMBRYANTHEMUM, Ice Plant (Ficoideæ).—A large genus of fleshy plants, producing lovely flowers. *Soil:* Plant in sandy loam with a little leaf mould and lime, in June. The tender species should be lifted and wintered in the greenhouse. *Increase:* By seeds sown in the greenhouse in March and the seedlings planted out in May; the hardier species by seeds sown in April in their permanent position; also by cuttings taken with a heel, dried in the sun.

MEZEREON (Thymelæaceæ). Deciduous. Relative of the spurge laurel. Sometimes cultivated because it is sweet smelling, the colour varies between white, pink, red or purple.

MICHAELMAS DAISY, Perennial Aster (Compositæ).—Very popular hardy herbaceous perennials which flower in late summer and autumn, when blooms are becoming scarce. *Soil:* Good, moist, heavy loam with wood ashes. If large flowers are required thin the buds rather than give rich soil. *Increase:* By division of clumps in autumn, or by seeds sown in pans or pots. Sow thinly to prevent damping off. When the plants attain the third leaf, prick off into shallow boxes.

MIGNONETTE, *Reseda* (Resedaceæ).—Hardy annual, biennial and perennial herbs. The red, white and yellow varieties give the most pleasing effect for table decoration. They are sweetly scented. *Soil:* Two parts loam to one of manure and a little sand in pots under glass, or in ordinary garden soil outdoors, with some lime rubble. *Increase:* By seeds sown in the spring and thinned out to 12 in. apart when large enough.

MIKANIA (Compositæ). — Half-hardy evergreen flowering climbers. *Soil:* Ordinary good garden soil. Plant in spring, against south or south-west wall. Lift in October and store for the winter. *Increase:* By cuttings. Cut back after flowering.

MIMOSA (Leguminosæ). — Usually treated as a tender annual, and grown as a pot plant for cool greenhouse. *Soil:* Loamy soil with a little peat and sand. *Increase:* By seeds sown in a warm house in spring.

MIMULUS, Monkey Flower (Scrophulariaceæ).—Hardy and half-hardy annuals and perennials, very suitable as bedding plants. *Soil:* Rather moist. *Increase:* By seeds sown in heat in February and planted out after hardening. The perennials also by division. In cold districts it is best to lift the plants and winter them in a frame.

MINT.—*See* HERBS; MENTHA.

MIRABILIS, Marvel of Peru (Nyctaginaceæ).—A showy plant that was once a great flower-garden favourite. Easily grown as half-hardy annual, being raised under glass in spring. It is, however, a perennial. *Soil:* Ordinary good garden soil. *Increase:* By seeds sown in heat in spring, and hardened off for planting out in May.

MISTLETOE, *Viscum* (Loranthaceæ).—A very interesting semi-parasite. The best method of growing it is to press the contents of a ripe berry on the underside of a branch towards the end of winter. It takes easily to Apples, Hawthorns, Limes and Poplars. It prefers the Apple owing to its softer cortex. On the Oak tree it is very slow in spreading.

MOCK ORANGE.—*See* PHILADELPHUS.

MONARDA, Bergamot (Labiatæ).—Hardy herbaceous perennials with pleasantly-scented leaves. *Soil:* Ordinary garden soil. Plant in spring or autumn. *Increase:* By division in spring, or by seeds sown in light soil out of doors in April.

MONKEY-NUT, *Arachis.*—Stove annual with yellow flowers. *Soil:* Loamy soil with mixture of leaf mould and sand. *Increase:* By seeds sown in spring; plant seedlings in small pots and grow in a light position. Temperature, 75°-85°.

MONKSHOOD, *Aconitum* (Ranunculaceæ).—Hardy herbaceous perennials. Poisonous, yet very lovely, plants. The roots have been mistaken for Horse-radish and eaten, with fatal results. *Soil:* Cool, rich soil in shady position. *Increase:* By seeds sown in a warm position in April, or by division in spring. As the plant roots are poisonous this is best done by a responsible person.

MONTBRETIA (Iridaceæ).—Perennial. Various shades of yellow, and rich red. *Soil:* Ordinary border soil. Plant in autumn or spring. Lift annually in autumn. Replant 3 or 4 in. apart.

MORÆA (Irideæ). — Pretty bulbous plants similar to Irises. Suitable for the conservatory or greenhouse. *Soil:* Sandy loam. Lift and replant bulbs annually. *Increase:* By offsets.

MORICANDIA (Cruciferæ). — Pretty tender plant, introduced to England from China many years ago. *Soil:* Mixture of loam, two parts, and one part each of manure and sand. *Increase:* By seeds sown in June and July in a cold frame. Pot up the seedlings singly and repot in October.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MORINA (Dipsaceæ).—Hardy and half-hardy perennials. For growing on a warm rockery and in borders. *Soil:* Light, warm, moist, sandy loam in a sheltered place. *Increase:* By seeds sown in heat in early spring, or by division of roots after flowering.

MORISIA (Cruciferæ).—Pretty hardy perennials, suitable for the rockery, bearing yellow flowers in May, rising from a flat rosette of glossy leaves. *Soil:* Poor, sandy loam. *Increase:* By seeds sown in light soil, or by runners.

MORUS, Mulberry (Moraceæ). — Deciduous tree with large leaves and small flowers, succeeded by the well-known fruit. *Soil:* Light, rich, moist loam. Trees planted on heavy ground generally refuse to ripen their fruits. Shorten shoots in February and thin out overcrowded branches. *Increase:* By seeds sown in light, sandy soil in May. By layering in spring. Also by cuttings in September. The fruit ripens in August onwards. Height about 30 ft.

MUEHLENBECKIA (Polygonaceæ).—Deciduous and evergreen shrubs and climbers bearing white flowers in late summer. *Soil:* Any good garden soil. *Increase:* By division or cuttings under a hand-light in early summer. Plant in autumn or spring and protect in winter with litter

MULBERRY.—*See* MORUS.

MULLEIN, *Verbascum* (Scrophulariaceæ).—Hardy biennials and herbaceous perennials. *Soil:* Ordinary garden soil. *Increase:* By seeds for all the species, also by division. The sub-shrubs by cuttings in spring.

MUSCARI.—*See* GRAPE HYACINTH.

MUSHROOM, *Psalliota campestris.*—Cultivation of mushrooms calls for the greatest care and attention to detail. The stable manure which forms the basis of the bed must come from healthy horses bedded on wheat straw and fed on corn and oats. It must be acquired perfectly fresh, stacked carefully into a neat heap five feet high in a shed or under cover, and completely turned and restacked at least five times at intervals of five days, watering if it becomes at all dry. When free from unpleasant smell it is built into beds four feet wide and nine inches deep, firmly packed. When the temperature falls to 70° F. plant the prepared spawn as directed by the makers.

After 8 or 9 days the spawn should begin to "run" or grow in the manure. The bed is then covered or "cased" one inch deep with pure, clean, freshly-dug soil, and kept moist. At 65° F. mushrooms should appear in 6 to 8 weeks after casing.

MUSK, *Mimulus moschatus* (Scrophulariaceæ).—Presents a colourful display of yellow, red and scarlet flowers. Some are mottled. The plant thrives in warmth and moisture.

MUSTARD, *Brassica alba.*—Generally is used with Cress for salads, and also used as manure, for which *see* GREEN MANURE. *Soil:* Rich. *Increase:* By seeds sown from March onwards. Cover with boards or mats until the seeds germinate and water plentifully. Gather when 1 in. high. For indoor culture sow on surface of soil in shallow boxes and cover with sheet of paper or board

MYOSOTIDIUM, The New Zealand Forget-me-not (Boraginaceæ).—A pretty herbaceous perennial suitable for the rockery. *Soil:* Peaty soil in shady position. *Increase:* By division in spring, or by seeds in spring.

MYOSOTIS.—*See* FORGET-ME-NOT.

MYRICA, Bog Myrtle (Myricaceæ).—Hardy deciduous and evergreen shrubs with very fragrant, shining leaves. Flowers in May. *Soil:* Prefer a peaty soil. No pruning is required. *Increase:* By seeds sown out of doors in ordinary soil in autumn; by layers or suckers in autumn. Plant autumn or spring.

MYRRHIS (Umbelliferæ). — Hardy perennial fragrant herb. *Soil:* Ordinary. Plant in October or March. *Increase:* By seeds sown out of doors or by division in spring or autumn.

MYRTUS, Myrtle (Myrtaceæ).—Lovely evergreen shrub grown mainly for its aromatic foliage. Suitable for growing in tubs. *Soil:* Any good soil in sunny position. Height 10-15 ft. *Increase:* By half-ripened cuttings in slight heat, in early summer.

N

NAPHTHALENE.—A product from the distillation of coal-tar. Is now used extensively alone or with other substances as a soil fumigant. It may be mixed with twice its weight of fine sand, sifted earth or ashes, and applied at the rate of 2 lb. to each rod, and dug in to a depth of 6 in. or more.

NARCISSUS (Amaryllidaceæ).—In this genus of bulbous plants are included all the kinds of Daffodils, with short and long trumpets, Jonquils, Pheasant's Eyes, double Daffodils, and many dwarf varieties for cultivation in the rock garden. *Soil:* Ordinary, well dug. Plant as soon as the bulbs are obtainable, preferably in August. Do not lift annually, but only lift and divide when the groups become overcrowded and cease to flower. This genus is ideal for naturalizing in grass, or in the wild garden. Narcissi are also suitable for growing in pots or bowls. *See* BULBS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BEST TO GROW.—*For garden decoration:* "Conspicuus" yellow with red crown; "Emperor," light yellow; "Empress," white and yellow; "Golden Spur," golden yellow; "Horace," white with red-bordered cup; "King Alfred," the deepest of yellows; "Ornatus," white with red-edged cup; "Sir Watkin," pale yellow with dark cup; "Van Sion," double yellow.

NARDOSTACHYS (Valerianaceæ). — Hardy perennials suitable for the rockery. *Soil:* Ordinary. *Increase:* By cuttings.

NARTHECIUM, "Bog Asphodel" (Liliaceæ).—Herbaceous plant suitable for the mixed border. *Soil:* Sandy peat, or sand and leaf mould. *Increase:* By division.

NASTURTIUM, *Tropæolum* (Tropæoliaceæ).—Hardy and half-hardy annuals and perennials, popularly known as Nasturtiums. The annual nasturtiums, including Canary Creeper, will grow in any ordinary soil from seed sown where they are to grow in April. If preferred, the seeds can be sown under glass, and the seedlings planted out when a few inches high. The tuberous-rooted perennials are nearly all half-hardy, and are best lifted in autumn and kept in dry sand until spring. These can be increased by laying the young shoots in the ground when they commence growing; a tuber will usually form at the bend. The greenhouse evergreen and herbaceous varieties can be potted in light, rich soil, and increased by cuttings or by seeds. Some species are suitable for covering trellis or pillars, or for the decoration of hanging baskets.

NASTURTIUM (Officinale). — Water Cress. *See* CRESS, WATER.

NECTARINE. — *See* FRUIT AND ITS CULTURE.

NELUMBIUM, Egyptian Lotus (Nymphæaceæ).—Plants suitable for still waters, in a temperature not lower than 48°. When at rest, the soil may be allowed to get dry. (*See also* WATER PLANTS.)

NEMESIA (Scrophulariaceæ). — Half-hardy annuals. *Soil:* Ordinary, light, in a sunny position. *Increase:* By seeds sown under glass in March, grown cool and planted out at the end of May, or seed may be sown outside in light soil in May.

NEMOPHILA (Hydrophyllaceæ). — Hardy annuals which can be sown in August or September, or in April or June. They make good edgings or carpets of colour. *Soil:* Ordinary; sunny position.

NEPENTHES, Pitcher-Plant (Nepenthaceæ).—Stove evergreen perennials. Insectivorous. *Soil:* Equal parts loam, peat and sphagnum moss with some sand and charcoal. Best grown in baskets suspended from the roof of the house. Pot in January or February. Minimum temperature, 60°. *Increase:* By offsets or seeds, under glass.

NERINE, the Scarlet Guernsey Lily (Amaryllidaceæ). — Greenhouse bulbs, which can be grown in a warm, sheltered border in the south of England. *Soil:* Three parts loam, and equal parts leaf mould and sand. Pot in autumn and top-dress annually, but only repot every four or five years. *Increase:* By offsets.

NERIUM, Oleander (Apocynaceæ). — Greenhouse evergreen shrubs with fragrant flowers. *Soil:* Six parts loam, two parts leaf mould, one part sand. Pot in spring, and prune immediately after flowering. Minimum temperature, 45° *Increase:* By cuttings.

NEW ZEALAND BURR, *Acæna* (Rosaceæ). — Hardy evergreen trailing plants suitable for the rock garden. *Soil:* Moist, sandy loam. *Increase:* By seeds sown under glass in March, by cuttings in August, or by root division in April.

NICOTIANA, Tobacco Plant (Solanaceæ).—Half-hardy perennials. Usually grown annually from seeds. *Soil:* Warm, rich loam, in a sheltered position. Surround with soot to keep slugs at bay. Can be grown as pot plants in the greenhouse.

NIEREMBERGIA (Solanaceæ).—Half-hardy perennials suitable for the rock garden or pots. *Soil:* Three parts sandy loam, one part manure with a little sand. *Increase:* By seeds, cuttings or division.

NIGELLA, Love-in-a-Mist (Ranunculaceæ).—Hardy annuals. *Soil:* Ordinary. *Increase:* By seeds sown in March or May, and thinned to 6 in. apart. Useful for cut flowers.

NIGHT-SCENTED STOCK, *Matthiola bicornis* (Cruciferæ).—Hardy annual. *Soil:* Moist, in any out-of-the-way places. *Increase:* By seeds where they are to flower. The plants grow 1 ft. high and remain closed during the daytime, and therefore inconspicuous, but in the evening they open and resemble small, single stocks, purple in colour, and with a delightful perfume.

NITRATE OF SODA. — A valuable soluble, nitrogenous fertilizer, suitable for applying to plants that are in active growth.

NITRO-CHALK.—A fertilizer combining the advantages of sulphate of ammonia and nitrate of soda. It also contains lime.

NUTS.—Many kinds of nuts can be grown with extraordinary ease by the gardener, and it is rather a pity that nut culture is not more popular. The Filberts and Hazel nuts in particular thrive on poor soils where the cultivation of fruit is sometimes difficult. Other varieties of nuts which can be grown, and will fruit quite successfully in most seasons, are Walnuts, Chestnuts and Almonds.

Soil: Preparation for the planting of nut trees should be similar to that recommended

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for fruit cultivation, that is to say, the soil should be dug to a depth of 2 or 3 ft., manured, if possible, and dressed with lime. Planting can be done at any time when the leaves are absent from the trees, and stakes should be immediately provided to prevent trees from swaying in the breeze and from breaking the fibrous roots.

NUTTALIA (Rosaceæ). — Deciduous shrubs with sweet, almond-scented flowers in pendent racemes from January to March, followed by showy purple fruits. They are hardy. There are male and female forms and both should be planted together. *Soil:* Well-drained. *Increase:* By division.

NYMPHÆA, Water Lilies.—*See* WATER PLANTS.

O

OAK, *Quercus* (Cupuliferæ).—Deciduous and evergreen trees and shrubs, which produce valuable timber. *Soil:* Rich loam, or deep woodland soil over chalk. Plant in October, young plants are more likely to succeed than older plants. *Increase:* By seed or grafting. The acorns ripen in the autumn, and should be sown as soon as ripe, or else stored in sand to prevent them becoming too dry. To produce shapely trees, remove the lower branches gradually as the tree grows.

ODONTOGLOSSUM. — Greenhouse orchids. *See* ORCHIDS.

ODONTONIA.—A new race of Orchid hybrids for the greenhouse. *See* ORCHIDS.

ŒNOTHERA.—*See* GODETIA *and* EVENING PRIMROSE.

OLEA.—*See* OLIVE.

OLEANDER.—*See* NERIUM.

OLEANDRA, Stove Ferns.—*See* FERNS.

OLEARIA, Daisy Bush (Compositæ).—Hardy and half-hardy evergreen shrubs with clusters of white, daisy-like flowers in July and August. *Soil:* Light, non-limy loam. *Increase:* By cuttings.

OLIVE, *Olea* (Oleaceæ). — Half-hardy evergreens. *Soil:* Well cultivated, in a sheltered position. *Increase:* By cuttings.

OMPHALODES (Boraginaceæ).—Hardy annuals and perennials, suitable for the border or rock garden. *Soil:* Ordinary, in shade. *Increase:* By seed, perennials by division.

BEST TO GROW.—*O. linifolia.* "Venus's Navel Wort," white, 6 in. May to August. Hardy annual. *O. verna.* "The Creeping Forget-me-not." March to May, rich blue, 6 in.

ONCIDIUM. — Stove and greenhouse epiphytal orchids. *See* ORCHIDS.

ONION, *Allium cepa.* — A vegetable second in popularity only to the potato. *Soil:* Deeply cultivated, adequately manured, and allowed to settle so that the subsoil is fairly firm before any planting or sowing is done. Dress with lime. *Increase:* By seeds sown in drills where they are to grow, or in seed-boxes or a nursery bed, for transplanting later. If sown in February or March the seeds should be sheltered in a cold frame covered with matting at night, and hardening off should be gradual and thorough. For exhibition culture the seeds should be put singly into small pots as soon as they are large enough to handle.

When planting out, set the seedlings 4-6 in. apart in rows a foot apart. Give more room than this where large exhibition onions are to be grown.

The surface soil of the onion bed should have a very fine tilth to a depth of 2 or 3 in. Dress the bed with lime and soot during May to prevent attacks of the onion fly, or if preferred, spray the plants frequently with Jeyes' fluid, one part in 100 parts of water. Feed with nitrate of soda during growth to increase the size of the bulbs.

ONION FLY.—*See* PESTS AND DISEASES.

ONION SETS.—Small bulbs of the size of a large marble. These are pressed into the soil to half their depth at distances of 9 in. apart and allowed to grow on in the same way as onion seedlings. They are very useful where it is impossible to raise onions from seed, and as they are not attacked by the onion fly, they are recommended where this pest is very troublesome.

ONOCLEA. — Attractive hardy ferns. *See* FERNS.

ONONIS (Leguminosæ). — Hardy and tender annuals, biennials and perennials. *Soil:* Ordinary, well drained. *Increase:* By seeds. The perennials also by division in autumn or spring.

ONOSMA (Boraginaceæ).—Hardy perennials. *Soil:* Two parts loam, one part sharp sand. Suitable for the rock garden. Plant in spring in a sunny, well-drained position. *Increase:* By seeds or cuttings.

ONYCHIUM.—Greenhouse and hardy ferns, allied to Pteris. For cultivation *see* FERNS.

OPHIOPOGON (Haemodoraceæ). — Half-hardy perennials, useful for pots or border culture. *Soil:* Light, sandy. Grow under glass in winter. *Increase:* By division in spring. All the species bear racemes of purple and violet flowers from June to August and attain a height of 1½-2 ft. The variegated variety is the best for pot culture.

OPHRYS.—Bee, Fly, or Spider Orchid. Hardy terrestrial Orchids. For cultivation *see* ORCHIDS.

ORCHIDS.—The family Orchidaceæ contains an extraordinarily large number of genera, among which are some of the most

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

popular inhabitants of our greenhouses, as well as many hardy plants that are suitable for cultivation in borders, rock gardens, woodland and water gardens. All are known under the general name of "Orchid." A full description of the plants and their cultivation would fill volumes, but the following brief outline will serve as a guide to the cultivation of the most popular types.

Warm-house Orchids.—These are grown in a temperature of 65°-70° by night, and 70°-85° by day in spring and summer, dropping to not less than 60° at any time. These orchids are mostly grown in a mixture of well-chopped fibre and Sphagnum moss which is packed round the roots in the pots or pans or baskets.

Intermediate-house Orchids.—These are grown in a temperature of 60°-65° in summer, dropping to not less than 50° in the winter. The soil for this group also is Osmunda fibre and Sphagnum moss.

Cool-house Orchids.—These are kept to a temperature of about 60° in the day and 55° at night during the summer, and not less than 45° during the winter. Fibre and moss are again used for potting.

Hardy Terrestrial Orchids.—These can be grown in the soil of the open garden and are not at all difficult to cultivate. As they are mostly more suited to the rock garden than any other place, and as most of them also like plenty of moisture, a position in the rock and water garden is often the most suitable. Some orchids do not flower every year in nature, and naturally will not do so in the garden.

Resting period.—Nearly all orchids require a resting period after their season of bloom, and this naturally varies according to the time of year that the flowers appear. Generally speaking, however, the greenhouse orchids may be allowed to rest during winter; repot in February.

ORIGANUM (Marjoram). — *See* HERB GARDENS AND MARJORAM.

ORNITHOGALUM, Star of Bethlehem (Liliaceæ).—Hardy and greenhouse bulbs, excellent for pot culture. *Soil:* For the hardy species, sandy loam in a warm border. For greenhouse culture, loam and peat. Protect hardy species in winter. Plant in autumn. *Increase:* By offsets and seeds.

ORPINE LIVE-LONG, *Sedum telephium* (Crassulaceæ).—Related to the stonecrop. Belongs to the wild genera but is sometimes cultivated. Deep purple flowers July-August. Height 6 in. to 2 ft. Flourishes in hot, dry places.

OSIER.—*See* SALIX.

OSMANTHUS (Oleaceæ). — Evergreen shrubs or small trees. *Soil:* Good sandy loam. *Increase:* By seeds or cuttings.

OSMUNDA. The hardy "Royal Fern." For cultivation *see* FERNS.—Osmunda fibre is the dried fibre of these ferns. It is used largely in the potting compost for orchids and other greenhouse plants.

OSTROWSKIA (Campanulaceæ). — Hardy perennials. *Soil:* Rich, in a sunny position. In a cold district these plants should be grown in the greenhouse. *Increase:* By seeds.

OURISIA (Scrophulariaceæ). — Hardy creeping perennials suitable for the rock garden. *Soil:* Moist, rich loam in a shady position. *Increase:* By division or seeds.

OXALIS (Geraniaceæ).—Hardy annuals and perennials, half-hardy perennials and bulbs, greenhouse perennials, and a few stove evergreens. *Soil:* Light, sandy loam with peat or leaf mould under glass. Light soil in a warm situation in the open.

OXYPETALUM (Asclepidaceæ).—Stove evergreen climbers. *Soil:* Fibrous peat and sandy loam. *Increase:* By cuttings.

OXYTROPIS (Leguminosæ). — Hardy perennials. *Soil:* Dry, sandy loam in full sunshine. *Increase:* By seeds or cuttings.

P

PACHYSANDRA (Euphorbiaceæ). — Hardy compact evergreen shrub for carpeting or rockeries. *Soil:* Moist loam. *Increase:* By cuttings in summer.

PALIURUS (Rhamnaceæ).—Hardy deciduous flowering shrub. *Soil:* Ordinary. *Increase:* By seeds, by cuttings and by layering.

PAMPAS GRASS, *Cortaderia* (Gramineæ).—Hardy perennial grass with tall, silky plumes of yellow or purplish flowers. *Soil:* Well-drained, rich, light soil. *Increase:* By seeds sown in sandy soil in spring under glass. The male and female flowers are borne on different plants.

PANSY.—*See* VIOLA.

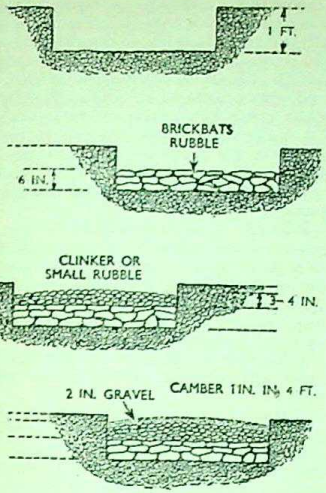
PAPAVER.—*See* POPPY.

PASSIFLORA (Passifloraceæ).—Greenhouse and half-hardy semi-evergreen climbing plant. *Soil:* For potting use a compost of loam and sandy peat, and good ordinary soil for out of doors. Pot in February or March and plant out in March or October, by a south or south-west wall. Water frequently. Prune in February by cutting back weak shoots. Mulch in winter. *Increase:* By seeds sown in sandy soil in heat or by cuttings.

PATHWAYS.—An average width is 4 ft., but 2 ft. is possible through the vegetable garden. Nine feet is wide enough for a car drive. Remove soil from proposed site to depth of 6-12 in. Lay drains either centrally for 4-ft. path or on either side for 9 ft. Remove all perennial weed roots by hand or with weed-killer. Fill in half

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



MAKING A GRAVEL PATH

Foundations should be the same for all paths in the garden, but paving should always be set on a final layer of sand or firm ashes in order to assist drainage

of trench with clinker, half-bricks, etc. Cover with a layer of finer clinker, coarse gravel, etc., and finally lay a 2-3-in. depth of surfacing material. Roll all foundations thoroughly before surfacing.

To prevent the growth of weeds on paths, especially gravel, a bituminous binding material may be dressed on to the surface. A good weed-killer watered over the path is much better for keeping paved paths in order, than the laborious and unsatisfactory method of hand weeding. One pound of copper sulphate in 6 gallons of water is a good home-made weed-killer for paths.

PAULOWNIA (Scrophulariaceæ). — Ornamental foliage tree having large, soft leaves, and when some years old, panicles of lavender flowers. *Soil:* Rich, well-drained loam. Plant in winter. *Increase:* By seed sown in sandy loam in spring.

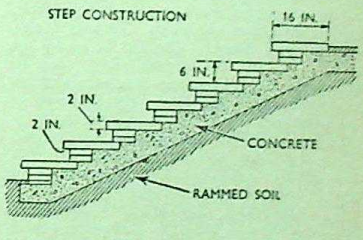
PEA, *Pisum sativum* (Leguminosæ).— A useful hardy vegetable. *Soil:* This should be thoroughly well prepared in autumn prior to planting. If they are to be grown between other crops, dig out a trench where the peas are to stand, 2 spits deep. Replace the broken-up soil, at the same time mixing in with it very old manure, wood ash and bone meal, and if deficient in lime, sprinkle over the soil slaked lime at the rate of 4 oz. to the square yard when the digging is finished. Peas may be grown on land that has been well manured for the previous crop that was grown on it, as too fresh manure tends to produce leafy growth at the expense of the crop.

Best time to sow: for the earliest crops of all, seed may be sown in cold frames in November, to ensure strong plants for setting out in March in shallow trenches. The earliest outdoor sowings may be made in March, as even if the seed is sown in November outside, the crop is rarely earlier. Fork over the soil before sowing and make drills for the seeds 4-6 in. deep.

Best to Grow. — Early: "Kelvedon Triumph," 1¾ ft., "Laxton's Superb," 2½ ft. Maincrop: "Lincoln," 2 ft., "Onward," 2½ ft. Late: "Gladstone," 4 ft. The seeds are of different types, round and wrinkled. The former are hardier and better for winter sowings.

PELARGONIUM, ZONAL (Geraniaceæ).—Tender flowering shrubs popularly known as geraniums, and chiefly used for summer bedding. *Soil:* For bedding they may be set out in June. *Increase:* Bedding plants by cuttings taken in July or August, and inserted singly in 2-in. pots in a very sandy soil. The pots are best wintered in a cool house, and should be shaded until the roots have formed. In spring transplant the cuttings into larger pots containing a compost of good loam, leaf mould, and sand, to which has been added bone meal or superphosphate. Water more liberally as growth progresses and plant out in June. The main thing to remember in keeping Pelargoniums in winter is to keep them dry, as they are liable to suffer from damping off. Give stimulants when in flower.

PENTSTEMON (Scrophulariaceæ). — Hardy and half-hardy herbaceous and subshrubby perennials. *Soil:* Two parts of loam, one of decayed manure or leaf



Steps made of York paving stone are very pleasing in the formal garden. For easy walking, make the rises six inches or less

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mould. Plant in March or April in borders or rock gardens. *Increase:* By seeds sown in gentle heat in early spring and the seedlings planted out in May. Also by cuttings from the lower branches of the stems in sandy soil in a frame in August.

PEONY, *Pæonia* (Ranunculaceæ).—Hardy and shrubby perennials. *Soil:* Two parts of loam with one of old cow manure very well dug. Plant tree peonies in September or March in beds of compost. Mulch in spring with cow manure and protect with litter in winter. Flowers after three years. Plant herbaceous species in September in sunny borders. If well manured the plants may be left for years, as they hate to be disturbed. Top dress annually with manure and water copiously in dry weather. In pots use a compost of two parts of loam with one part each of manure and silver sand. Pot in October or November. Keep in a cool greenhouse until spring. Stand out of doors in warm weather. *Increase:* By dividing the roots when replanting, by seeds, and the tree species by grafting.

PEPEROMIA (Piperaceæ).—Stove annuals and perennials with inconspicuous flowers and fleshy leaves; useful for baskets or tree stumps. *Soil:* Fibrous loam and peat with sand. Shade from hot sun; water frequently and syringe daily in summer. *Increase:* By cuttings in heat.

PERAPHYLLUM (Rosaceæ). — Hardy deciduous shrub with small, white flowers in clusters of three, followed by edible fruits. Rarely flowers outdoors in Britain. *Soil:* Ordinary. *Increase:* By layers.

PERILLA (Labiatæ). — Half-hardy annual foliage plants. *Soil:* Light, rich. Plant out at the end of May for summer bedding. *Increase:* By seeds sown in heat in March.

PERIPLOCA (Asclepiadaceæ).—Hardy deciduous climbers. *Soil:* Good ordinary. Plant in spring or autumn to grow on walls, arbours, etc. Prune weak and old shoots in March. *Increase:* By division or cuttings rooted under a bell glass.

PERIWINKLE, *Vinca* (Apocynaceæ).—Hardy evergreen trailing and stove shrubs. *Soil:* Ordinary out of doors. In pots, loam, manure and sand. Pot in February or March. Prune old shoots right back in January. Keep in sunny frame from June to September. *Increase:* By cuttings of young shoots, by division, and by seeds.

PERNETTYA (Ericaceæ).—Hardy evergreen flowering and berry-bearing shrubs. *Soil:* Peaty. Dislikes chalk. *Increase:* By seeds, division and cuttings.

PEROWSKIA (Labiatæ). — Deciduous shrubs for warm borders. *Soil:* Good, well-drained. Cut away old and dead wood in early spring. *Increase:* By cuttings set in sandy soil under a bell glass in July.

PERSEA (Lauraceæ).—Stove evergreen shrubs and trees having, on some species, edible fruits. One such is the avocado pear (*P. gratissima*) native to tropical America. *Soil:* A compost of equal parts of loam and peat with a little sand. Pot in March, and water freely in summer. Syringe daily in hot weather. Minimum temperature 50°. *Increase:* By seeds sown in similar compost at a temperature of 85°. Also by cuttings of firm shoots in sand under a bell glass.

PESTS AND DISEASES.—In the natural floral world there is no such thing as a pest, for everything has its appointed use in maintaining a balance. In cultivation, however, insect pests and fungous diseases are a serious menace demanding constant vigilance.

Following are some of the more common pests and diseases which attack garden crops:

Ants.—Do not do much damage in the garden but are considered a nuisance as they tunnel in lawns and flower beds. Sometimes climb rose stems in search of aphis. Controlled by pouring an ounce of carbon bisulphide into the nest. A chalk line, 2 in. wide, round plant stems will stop ants from reaching flower buds. Powdered alum or naphthalene will eradicate ants from garden walks.

Apple Aphis.—Attack apple leaves and flower buds in early spring. Spraying with tar distillate wash in winter is effective.

Apple Blossom Weevil.—The eggs are laid in the flower buds in spring, and the larvæ feed in the folded petals. If a piece of sacking is tied round the tree trunk, the weevils will hibernate there instead of in the buds. The sacking can then be carefully removed and burnt.

Apple Canker.—A fungous disease in which spores enter the tree through cracks in the bark. After a time the wood around the crack dies, the trunk is surrounded by rings of cankerous growth, and eventually the tree is killed. Diseased branches should be cut away and burnt and any cracks or wounds in the bark should be painted with creosote or pruning paint.

Apple Sawfly.—The eggs are laid in the blossom and the larvæ later enter the apple fruitlets by a small hole. They then eat out the core, filling the centre with brown-coloured pus. The fruitlets frequently fall before ripe. If the trees are sprayed with nicotine a day or two after the petals fall, the larvæ will be prevented from entering the fruitlets.

Apple Sucker. — Orange-coloured eggs may be seen at the base of the flower buds in winter. When hatched the larvæ crawl up into the buds and eat their way in. The buds may blossom but wither on the tree.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Spray early with nicotine before the larvæ enter the buds, and use a tar-oil winter wash in late autumn.

Big Bud.—Eggs are laid in the buds, and the mites which develop set up an irritation which causes the bud to swell. They live in the bud all the winter so spraying is only effective as soon as the leaves begin to open. A lime-sulphur wash in the proportion of one part of lime to twenty of water should be applied then, and if followed by a further spraying a week later this pest can be controlled.

Bulb Mite.—The foliage of infected bulbs turns a pale, sickly yellow colour, and the mites will be found under the outer layer on the bulb. Potassium sulphide solution (one ounce to three gallons of water) can be used to soak slightly diseased bulbs in before planting. Leave them in the solution for about one hour. Badly infested bulbs are useless and should be burnt.

Cabbage Caterpillars.—The caterpillars of the large white butterfly are yellow and black, while those of the smaller butterfly are soft green. They eat away cabbage leaves, doing considerable damage. Spraying with derris wash as soon as the caterpillars appear is recommended.

Carnation Rust.—Can be identified by the small brown spots which appear on the leaves. Potassium permanganate diluted to a pale pink colour should be sprayed on the leaves during winter and early spring, at intervals.

Carrot Fly.—Eggs are laid at the base of the leaves and on hatching crawl into the carrot. Their presence can be detected by the leaves dying off. A quart of paraffin mixed with a barrowload of sand, and sprinkled on the ground between the growing crops should be effective if applied in dry weather. Badly diseased plants are useless and should be burnt.

Celery Fly.—The larvæ can be seen between the upper and lower layers of the skin of the leaf. These can first be observed by transparent patches on the leaves. Seedlings in boxes should be covered with butter muslin to protect them from the fly, and soot spread on the ground when planting out is an added protection. Spraying with a diluted paraffin solution every three days for some time after planting is beneficial.

Centipedes.—A beneficial insect as it feeds on slugs' eggs, etc. Millepedes (*which see*) are harmful insects.

Chrysanthemum Leaf Miner.—Bores into the leaves and leaves a trail of light silvery markings. Spraying with nicotine, ½ oz. to 2 gallons of water, is a good preventative. Pinching the leaves between the fingers (to kill the insect) is the only remedy once the insect has actually put in appearance.

Clickbeetle.—*See* WIREWORM.

Codling Moth.—The eggs hatch out at the end of May and the larvæ eat their way into the fruit, usually apples, although pears and plums are also attacked. After some time they leave the fruit by tunnelling out, and it is these tunnels which identify this pest from the apple sawfly. The fruits usually fall before ripe, and the larvæ, crawling out, hibernate in the soil during the winter. A tar-oil spray in winter destroys those that hibernate in the bark and soil. Sacking tied round the tree can be used while they are hibernating, so that the pest can be collected and destroyed. Commercial growers spray with lead arsenate, but this is not recommended for amateurs.

Cuckoo Spit Insect.—Easily identified by the frothy material with which the larva surrounds itself. They are found on the leaves of plants and commonly attack chrysanthemums and lavender. A good spray with ordinary water will clear away the froth, leaving the insect exposed. Spraying with nicotine wash will then kill it.

Daddy - Long - Legs. — *See* LEATHER JACKETS.

Damping-off.—A fungous disease which attacks seedlings, causing them to wither and die. The main remedy is to avoid over-crowding and excessive moisture. Space outdoor seedlings so as to obtain maximum of light. Provide ample ventilation for greenhouse seedlings.

Fairy Rings.—Fungus which sometimes appears on lawns. Syringe with 1 lb. of sulphate of iron diluted in three gallons of water.

Finger and Toe (Clubroot). — Attacks members of the cabbage family, causing swollen masses of tissue on the roots. Dress ground with finely powered lime, 4-8 oz. to the square yard. Leave the ground vacant for six months, then plant a non-cruciferous crop.

Gooseberry Sawfly. — Tiny caterpillars cluster on either side of the veins, but gradually spread and eat all the leaf, leaving the veins. Pick and burn infested leaves. Dust with hellebore or derris insecticide.

Hollyhock Rust.—Small brownish-yellow patches appear on the leaves and stems, causing the plants to die. Spray with potassium permanganate (1 oz. to one gallon of water), at fortnightly intervals through spring and summer.

Leather Jackets.—Eat at plant roots, causing bare patches on lawns, and plants such as Carnations, Chrysanthemums, etc., to die away at the base. Fumigate the soil with garden naphthalene at the rate of 2 oz. to the square yard, in the autumn.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mice.—Seeds shaken in a tin with a little linseed oil and red lead, before planting, will not be attacked by mice.

Millipedes.—Can be distinguished from centipedes, which are harmless, by the fact that they curl up when touched. Centipedes hurry away. A soil fumigant in autumn is recommended.

Moles. — Troublesome on lawns and borders because of their throwing up mounds of soil. Plug the holes with rags soaked in creosote or tar. Drop pieces of calcium carbide in holes at various parts of the tunnels.

Mussel Scale.—Identified by clusters of scales on the bark of apple trees. Use a tar-oil wash in late autumn.

Onion Fly.—Eggs are laid near the young plants when 2-3 in. high. Spray young plants with one part paraffin emulsion to twenty-five parts of water. Badly attacked old plants must be burnt.

Peach Aphis. — Causes the leaves of peaches and nectarines to curl up tightly and later to fall. Quassia or nicotine sprays are effective.

Pear Leaf Blister Mite.—Bright pink swellings appear on the leaves. Spray before the leaves fall in the autumn, using lime sulphur, 1 part to 20 gallons of water.

Pear Midge.—This attacks the fruitlets, causing them to swell and crack and fall about June. Dress the ground at the base of the trees with kainit in early spring.

Plum Aphis.—Causes the leaves to curl and die. A winter wash in autumn will destroy eggs, and a nicotine wash over the leaves before they curl is an added precaution.

Potato Disease.—Known by dark brown patches which appear on the leaf margins in June or July. The haulm may die right back, the spores then entering the tubers. The damage to tubers may not be noticeable until they have been stored some time. Spray with bordeaux mixture in June before the sun is on the plants, and again in July.

Rabbits.—Wire netting surrounding a garden with a foot sunk below the ground is effective, especially if the last 6 in. of netting are turned outwards. They will not pass a ring of paraffin and animal oil, if this is made on the ground round plants. String soaked in this mixture can be wound round stakes surrounding trees with good effect.

Raspberry Beetle.—Tiny maggots eat into the fruit and destroy the centre, so that the fruits will not keep. Dust the buds with derris powder as soon as the pest appears on them in spring.

Rats.—Use proprietary viruses which are effective and not harmful to humans or pets. Other poisons are dangerous

Rose Aphis (Greenfly).—Clusters appear round the buds in June. Spray with quassia and soft-soap washes.

Rose Leaf Cutter Bee.—Cuts large pieces from rose leaves during the summer, and can be seen at work in early morning when it can be caught. It sometimes stings. Alternatively spray with an insecticide.

Rose Mildew.—A disease which causes the leaves to curl, and covers them with silvery mildew. Use a spray of 1 oz. bicarbonate of soda to 10 gallons of water as soon as the leaves expand.

Silver Leaf.—Attacks plums and all stone fruits, also hawthorn and laurel. The leaves turn silver. Can only be controlled by cutting away and burning all diseased parts.

Slugs.—Noticeable in damp weather in the evenings. Are fond of fleshy rooted plants. Spray the ground in the evening with copper sulphate, one part to 100 parts water. Make two applications at 20-minute intervals. An alternative method is to use copper sulphate in its crystalline form. In this case, the crystals should be put down before the plants are put in, in the proportion of 1 cwt. to the acre.

Snails.—Sprinkle a mixture of one part powdered sulphate of copper and 18 parts kainit on the ground around plants and between rows of seedlings, in the early morning or late evening.

Sweet Pea Mildew.—Attacks stems and foliage after dry spells. Dust the plants when the dew is on them, with one part slaked lime to three parts sulphur. Repeat two or three times. Burn badly diseased plants.

Tomato Leaf Rust.—Dust leaves with flowers of sulphur.

Tomato Sleeping Disease.—No cure, burn all infected plants. Yellow blotches appear on the leaves causing them to wilt.

Vine Mildew.—Identified by a grey mildew appearing first on the leaves and later spreading to shoots and fruit. Dust with flowers of sulphur or spray with potassium sulphide solution when the leaves are full grown, when the fruit begins to set and again when the fruit is swelling.

White Butterfly.—*See* CABBAGE CATERPILLARS.

Wireworm.—Often apparent on light soils, or newly-dug gardens. Attacks most vegetables and flowers. Thorough cultivation exposes the pest to birds, who will eat it. Soil fumigation with garden naphthalene is effective.

Woolly Aphis.—American blight. Masses of white matter appear on the trunks and branches of old apple trees. Brushing of methylated spirit or paraffin emulsion on to the branches and trunks is effective.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PESTS AND DISEASES, REMEDIES TO PREPARE FOR

Bordeaux Mixture.—Obtainable in paste form from sundriesmen. This is more satisfactory than making it at home.

Carbolic Emulsion.—Carbolic acid, 1 pint; soft soap, 1 lb.; water, 10 gallons. Heat the water, dissolve in it some of the soap, stir in the carbolic and make up to 10 gallons.

Caustic Soda.—For winter-washing fruit trees use 3 lb. caustic soda to 10 gallons of water. Protect the eyes and body while spraying.

Derris Wash.—An insecticide made from derris root. Can be obtained in powder form for dusting, or, diluted with nine parts water, for spraying.

Fungicides.—A mixture containing copper is recommended for fungous diseases which appear inside the plant tissues, and one containing sulphur for those which live exposed.

Hellebore Wash.—Hellebore powder, 12 oz.; water, 3 gallons. Keep the mixture stirred while spraying as the powder does not dissolve readily.

Lead Arsenate (Poisonous).—Should be bought in paste form and the instructions on the tin strictly followed.

Lime Sulphur.—The best is purchased in concentrated form, as it is difficult to prepare at home.

Nicotine Wash (Poisonous).—Soft soap, 1 lb.; nicotine, ¾ oz.; water, 10 gallons. Dissolve the soap and add the nicotine whilst stirring.

Paraffin Emulsion.—Soap, 1 lb.; paraffin, 1 pint; water, 1 gallon. Warm the water and dissolve the soap in it, then spray in the paraffin through the fine nozzle of a syringe. This method forms a creamy emulsion, without free oil. Store the mixture in an air-tight bottle. Use one part of emulsion with 10-20 parts water as required.

Quassia Wash.—Quassia chips, 1 lb.; soft soap, 1 lb.; water, 10 gallons. Use fresh, bright-coloured chips, and boil them in water for two hours. Dissolve the soap in hot water and thoroughly mix this liquid with that strained from the chips. Make up to 10 gallons.

PETASITES (Compositæ). — Hardy perennial herbs with heart or kidney-shaped woolly leaves. *Soil:* Ordinary. Plant in October or November in shady woodland or shrubberies. *Increase:* By division of the rhizomatous roots in autumn.

PETROCALLIS (Cruciferæ). — Dwarf alpine hardy plants allied to Draba. Form compact cushions of tiny leaves offset by lilac-coloured flowers. *Soil:* Any poor, dry soil, as it flowers most freely in poor conditions. *Increase:* By seeds or division.

PETUNIA (Solanaceæ). — Half-hardy herbaceous perennials mostly grown in baskets or pots. *Soil:* A compost of two parts of loam to one each of well-decayed manure, and leaf mould with sand. Pot up in spring. To make bushy plants, pinch out the points of the young shoots. On old plants prune back the shoots fairly close in February. For bedding or ornamental vases plant out in June in ordinary rich soil. Lift in September and winter in the greenhouse. Water freely in warm weather, and apply fertilizers during the flowering period. *Increase:* By seeds sown in gentle heat in spring or by cuttings inserted in light, sandy soil at any time in spring.

PHACELIA (Hydrophyllaceæ).—Hardy annuals useful for edgings to borders or for a massed effect. *Soil:* Ordinary. *Increase:* By seeds sown in April. Thin out the seedlings 2-3 ft. apart in June.

PHASEOLUS. — *See* BEANS, CLIMBING FRENCH *and* BEANS, SCARLET RUNNER.

PHILADELPHUS, Mock Orange (Saxifragaceæ). — Hardy deciduous flowering shrubs producing lovely, fragrant flowers in June and July. *Soil:* Ordinary good, loamy soil. Plant at any time from October to February. Thin out shoots that have flowered after the flowers have died off. *Increase:* By cuttings in gentle heat or by layering.

PHILLYREA (Oleaceæ).—Hardy evergreen shrubs and small trees having usually fragrant white flowers and large leaves. *Soil:* Ordinary in sun or shade. Plant at any time in winter and prune by trimming off straggly shoots in spring. *Increase:* By cuttings of firm shoots in sandy soil in July.

PHILODENDRON (Aroideæ). — Stove evergreen shrubs and climbers with large, fleshy, decorative leaves. *Soil:* Equal parts of peat and loam with charcoal and silver sand. Pot or plant in early spring. Water frequently and syringe. *Increase:* By stem cuttings rooted in a close propagating case.

PHLOX (Polemoniaceæ). — Hardy and half-hardy annuals and perennials for borders, rockeries and summer bedding. *Soil:* For border plants rich, deep loam with plenty of moisture. Plant in spring or autumn according to whether they are early or late flowering, and mulch in April. Lift, divide, and replant perennials every three years. Plant rockery species in March in deep, rich, sandy loam in sunny position. Lift only when they are too large for their allotted space. Pinch back the shoots of annuals to induce bushy growth. *Increase:* Annuals by seeds sown in heat in March in boxes of light soil, the resultant seedlings

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

being hardened off for planting out in June. The perennials by seeds sown, when ripe, in heat in a greenhouse and planted out the following May; by cuttings of young shoots either rooted in a frame or out of doors; also by division in the spring or in the autumn.

PHOTINIA (Rosaceæ). — Half-hardy deciduous and evergreen flowering shrubs with small, tough leaves and clusters of hawthorn-like flowers in April and May followed by red berries. *Soil:* Good loam. Plant in autumn or spring and protect from excessive wet. *Increase:* By seeds sown in light soil in frame in spring or autumn or by cuttings in sandy soil in August.

PHYGELIUS (Scrophulariaceæ).—Half-hardy shrubby or herbaceous perennial, requiring wall protection. *Soil:* Ordinary light rich. Plant in full sun in March or April and cover in winter with litter or ashes. Lift and divide triennially. *Increase:* By cuttings in gentle heat or by seeds sown in light, rich soil in February or March, and the seedlings planted out of doors in May or June.

PHYLLANTHUS (Euphorbiaceæ). — Stove ornamental foliage plants with flowers produced on tips of the leaves. *Soil:* Two parts of loam with one each of cow manure and leaf mould. Pot up firmly in February or March. Syringe freely in summer. *Increase:* By cuttings in brisk heat

PHYSALIS.—*See* CAPE GOOSEBERRY.

PHYSOSTEGIA (Labiatæ). — Hardy herbaceous perennials useful for cutting. *Soil:* Ordinary in full sun. *Increase:* By seeds sown in flowering position in spring or by division of the creeping rootstock.

PHYTOLACCA (Phytolaccaceæ). — Hardy and half-hardy perennials mostly used for the shrubbery or wild garden. *Soil:* Ordinary. Plant in October or March. *Increase:* By seeds or division.

PIERIS (Ericaceæ).—Hardy evergreen flowering shrubs. *Soil:* Moist, light loam, or peaty leaf mould. Plant in September, October or March. If necessary water well in summer. *Increase:* By seeds sown in sandy peat or by division in March or September.

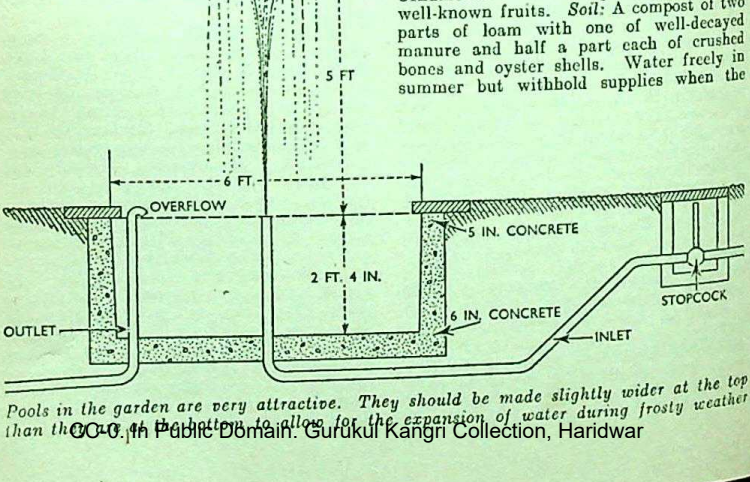
PILEA, Artillery Plant (Urticaceæ).—Herbaceous stove perennials having fine, fern-like leaves and small, uninteresting flowers that, when in bud, burst open if made moist, and discharge pollen. *Soil:* Compost of two parts of loam with one each of leaf mould and sand. Pot in early spring and water freely in summer. *Increase:* By division when repotting or by cuttings rooted in sandy soil in heat, also by seeds sown on the surface of fine soil in heat.

PIMENTA (Myrtaceæ). — Ornamental flowering trees for the stove with sweetly-scented leaves and berries. The leaves are used in Spain for sauces. *Soil:* A compost of two parts of sandy loam with one each of leaf mould and sand. Pot up or plant in beds in February or March. Water and syringe frequently in summer. Prune into shape in March. *Increase:* By cuttings in sandy soil in a closed frame.

BEST TO GROW.—*P. officinalis*, Pimento, or Allspice Bush has white flowers in May and June, 20 ft.

PIMPERNEL.—*See* ANAGALLIS.

PINEAPPLE, *Ananas* (Bromeliaceæ).—Ornamental stove evergreen bearing the well-known fruits. *Soil:* A compost of two parts of loam with one of well-decayed manure and half a part each of crushed bones and oyster shells. Water freely in summer but withhold supplies when the



Pools in the garden are very attractive. They should be made slightly wider at the top than the bottom, to allow for the expansion of water during frosty weather

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fruit begins to ripen. Full exposure to sun is essential. *Increase:* By suckers or crown of fruits inserted in small pots in heat.

BEST TO GROW.—*A. sativus* and its varieties with striped leaves, 3 ft.

PINES, *Pinus.*—*See* CONIFERS.

PINGUICULA, Butterwort (Lentibulariaceæ).—Insectivorous hardy and greenhouse perennials. The fleshy leaves are covered with hairs which trap insects by means of a sticky liquid. *Soil:* Sphagnum moss and peat. They need plenty of water and are useful in the bog garden. *Increase:* By leaf cuttings, by division of roots, or by seed sown in leaf mould and damp peat.

BEST TO GROW.—*P. grandiflora.* Hardy, 3-6 in., flowers May to June, lilac blue. Happy in moist part of rock garden.

PINKS, *Dianthus* (Caryophyllaceæ).—Hardy plants useful for border edgings, related to Carnations. *Soil:* Ordinary, sunny position where they can grow on undisturbed. Dressing of lime in autumn is beneficial. *Increase:* By cuttings pulled with a heel from below a joint in July. Plant out in September. Layering in July. By division in September or by seeds sown in boxes outdoors in May. Plant out seedlings in September.

BEST TO GROW.—*Dianthus plumarius.* Hardy border pinks. "Mrs. Sinkins" (white); "Aurora" (pink, maroon eye); "Pride of Waltham" (pink, with dark eye), etc., all 1 ft. high, flowering all summer. *Dianthus cæsius.* Cheddar Pink. Pale pink flowers May to July, 6 in. For rock garden. *Dianthus deltoides.* Maiden Pink (pink), 9 in., June. There are one or two good varieties of this pink. *Dianthus chinensis.* Indian Pinks. Biennials. Sow in May, many varieties.

PIPTANTHUS (Leguminosæ). — Evergreen shrubs. *Soil:* Well-drained, light soil. Plant in sheltered corner or against a wall. *Increase:* By cuttings, or by seed sown in slight heat.

PISTACIA (Anacardiaceæ).—Deciduous trees, growing to 20 ft. *Soil:* Ordinary garden soil or deep, rich, sandy loam. *Increase:* Cuttings or layers.

PISUM (Sativum).—*See* PEA.

PITTOSPORUM (Pittosporaceæ). — Evergreen vigorous shrubs or small trees. Not hardy in cold districts. Best against walls. *Soil:* Ordinary light soil. Easy to grow. Plant in spring. *Increase:* By cuttings in summer. Use sandy soil and cover with hand-light or frame.

PLACEA (Amaryllidaceæ).—Greenhouse bulbs, rather difficult of culture, but very beautiful. *Soil:* One part sand to three parts cow manure. Plant in boxes or borders rather than pots. Withhold water from August to December; give plenty during growing season. *Increase:* By seeds or offsets in rich, light soil.

PLAGIANTHUS (Malvaceæ). — Deciduous shrubs, not quite hardy, requiring wall protection in some districts. *Soil:* Loamy, with peat and sand. Prune out old wood after flowering. *Increase:* By cuttings, in sandy soil in a frame.

PLANE, *Platanus* (Platanaceæ).—Deciduous trees which shed their bark in winter. Used extensively for town planting, as they seem to thrive in smoky atmospheres and will stand drastic lopping. *Soil:* Ordinary, but appreciates a rich, alluvial soil in a sunny position. Plant from November to March and prune into shape when necessary. *Increase:* By autumn cuttings 10 in. long with a heel, or by seed.

BEST TO GROW.—*P. acerifolia.* London Plane. Large leaves, sometimes known as Maple-leaved Plane. 70 ft. *P. orientalis.* Eastern Plane. Trunk rugged and leaves deeply indented. There are also variegated forms.

PLEACHING.—An operation by means of which avenue-making trees, such as Limes, are trained to form espaliers. The branches are trained sideways to that they interlace to form an alleyway. Plant the trees 6 ft. apart, and prune in winter before the sap rises.

PLUMBAGO (Plumbaginaceæ).—Beautiful greenhouse evergreen, shrubby perennials. Some hardy varieties. *Soil:* Hardy varieties, ordinary garden soil. Greenhouse varieties, leaf mould and sand to three parts loam. *Increase:* By division in autumn (hardy) and by cuttings in spring (greenhouse).

POLEMONIUM, Jacob's Ladder (Polemoniaceæ). — Hardy perennials for rock garden and border. *Soil:* Light, sandy soil with addition of gritty loam for rock plants. *Increase:* By division in autumn or seed in spring.

POLIANTHUS, Tuberose (Amaryllidaceæ).—Greenhouse bulbs. *Soil:* Pot up singly and treat as for Hyacinths. In mild districts a sheltered spot and light, sandy soil is good. *Increase:* By offsets or seed.

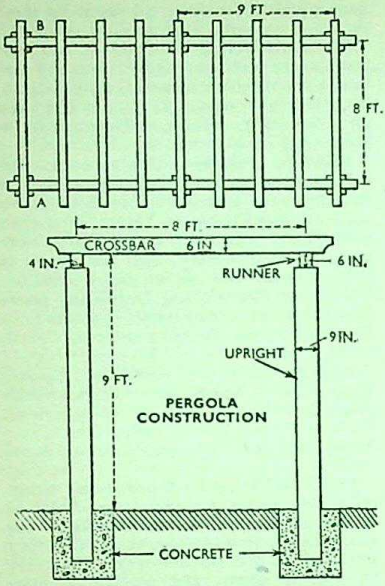
POLYGALA, Milkwort (Polygalaceæ).—Evergreen flowering shrubs, not all hardy. *Soil:* Peaty soil, free from lime, but including some sand. *Increase:* By cuttings in spring or by seeds.

POLYGONATUM, Solomon's Seal (Liliaceæ). — Hardy perennials suitable for shady borders and the wild garden. *Soil:* Any ordinary garden soil, preferably moist. *Increase:* Spread rapidly by means of rootstocks, and quickly naturalize. If desired may be divided in autumn.

POLYGONUM (Polygonaceæ).—Deciduous climbers, evergreen shrubs, herbaceous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



In small gardens where stone or oak uprights would be too heavy, larch poles, which may be used either singly or in pairs, can be erected to the above dimensions

perennials and annuals. *Soil:* Rich, deeply-dug site, in sun. *Increase:* By seeds outdoors in April, by division and cuttings of young wood, taken with a heel in summer. Climbers also by layering.

BEST TO GROW.—*P. baldschuanicum.* Rapid climber, 20 ft. in a season. Autumn flowering, white sprays of flowers flushing pink with age. *P. affine* and *vaccinifolium* grow 6-12 in. and are suitable for the rock garden. *P. capitatum*, annual, 4 in., suitable for rock garden. *P. orientale*, annual, 3 ft., purple flowers, border plant. *P. cuspidatum*, strong-growing plant for clumps in wild garden or as specimen on lawn. Creamy flowers, and large, ornamental leaves.

POPLAR, *Populus* (Salicaceæ).—Deciduous fast-growing trees that quickly form a wind screen, and some of which are grown for timber. *Soil:* Any moist, loamy soil. On dry or chalky soils they soon die off. Prune in winter. *Increase:* By seeds sown in a moist border in autumn, by cuttings, and the weeping varieties by grafting on the common Poplar.

BEST TO GROW.—*P. alba*, the White Poplar, leaves white on under surface, is useful to plant on [illegible] *P. balsamifera*, Balsam Poplar, fills the air with a balsamic scent when the leaves are opening. 80 ft. *P. canescens*, the Grey Poplar, leaves are greyish. It is perhaps the only one to succeed on chalky soils. *P. nigra*, Black Poplar, leaves are usually diamond shaped. Not often cultivated. *P. n. betulifolia*, or the Old English Black Poplar. *P. n. italica*, the Lombardy Poplar, one of the best pyramidal forms, makes a good wind break.

POPPY, *Papaver* (Papaveraceæ).—Brilliant hardy flowers, very popular for beds and borders. *Soil:* A rich, moist one in a sunny position is best, although they will thrive in any soil that is not light and dry. *Increase:* Annuals, by seed sown in April. Thin out seedlings as soon as they are fit to handle, and later thin them to 1 ft. apart to obtain strong plants. Perennials, by seeds sown in the sun out of doors or by division in spring. Mulch with manure to conserve moisture in summer.

BEST TO GROW.—*P. pavoninum*, Peacock Poppy, scarlet flowers blotched with black 18 in. *P. rhœas*, the common field poppy, from which the strain known as Shirley Poppies was derived. There are several double forms. Up to 2 ft. *P. somniferum*, Opium Poppy, has many single and double forms that are not attractive when separated, but are effective when grouped.

Perennial species are *P. nudicaule*, Iceland Poppy, with white, yellow or orange flowers, valued for cutting. Seed for these should be sown in light, warm soil in July and the seedlings wintered where they are sown. Transplant in the spring into their flowering quarters. *P. alpinum*, with yellow, orange or white flowers, is grown in the rock garden. 6 in. There are many strains of the Shirley Poppies and growers are always experimenting to obtain new forms and shades.

POPPY (Californian).—*See* ESCHSCHOLTZIA.

POPPY (Himalayan).—*See* MECONOPSIS.

POPPY (Horn).—*See* GLAUCIUM.

POPPY (Mallow).—*See* CALLIRHOE.

POPPY (Mexican).—*See* HUNNEMANNIA.

POPPY (Tree).—*See* ROMNEYA.

POPULUS.—*See* POPLAR.

POTASH.—*See* FERTILIZERS.

POTATO (Solanaceæ).—The potato is the most important of all vegetables; it is also one of the most disappointing, as it is rather tender and subject to disease. Given warm, dry weather from April to August there is no cause to worry, but in a cold spring there is the fear of frosts, and in a wet summer, of blight. *Soil:* Deeply-dug soil, and if lacking in humus, about 2 cwt. of decayed manure, supplemented by 6 lb. of Complete Fertilizer per square rod should be added in February, and the whole turned

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

well in. For early varieties drills should be drawn 2 ft. and for late varieties 3 ft. apart, all should be 4 in. deep. The seed tubers should be covered 5 or 6 in. with a light ridge of soil. The sets may be from 12 to 18 in. apart. When the plants are 8 to 9 in. high the soil should be drawn up to the tips.

Method of increase.—The only method of increasing potatoes in the garden is by means of tubers of the special varieties. The ideal potato tuber weighs about 2 oz. and is the size of an egg. As soon as the tubers are received they should be set on end to sprout, preferably in wooden boxes protected from frosts. Scotch seed gives 25 per cent better yield in S. England than home-saved sets. The tubers can be cut if they are larger than is given above, but care should be taken to leave one eye to each portion.

BEST TO GROW. — Early: "Sharpe's Express," "Arran Crest," "Epicure." Mid-Season: "Eclipse," "Great Scott," "Dunbar Cavalier." Maincrop: "Golden Wonder," "Kerr's Pink," "Doon Eire."

POTENTILLA (Rosaceæ). — Hardy shrubs and herbaceous perennials. *Soil:* Good garden, well-drained soil. Plant the shrubs in winter and the herbaceous species in spring or autumn. Water thoroughly in summer and mulch with manure in March. Lift and divide the border plants every three years. *Increase:* By seeds sown in light, sandy soil indoors in March, the seedlings being transplanted in May or June; by seeds sown out of doors in April; by division in spring or autumn when planting, or by cuttings struck in a frame.

BEST TO GROW.—*P. fruticosa*, a compact, yellow-flowered native shrub, has many forms with white, pale yellow and sulphur-yellow flowers. 1-3 ft. *P. alba*, white single flowers from April to July. 6 in. *P. nitida*, rose flowers in summer. 3-4 in.

POTERIUM (Rosaceæ).—Hardy perennials. *Soil:* Ordinary. Plant in spring or autumn and give plenty of water during the growing season. *Increase:* By seeds or by division of the roots when planting.

BEST TO GROW.—*P. canadense*, which has feathery, greyish leaves and handsome spikes of white flowers excellent for cutting. 4 ft. *P. officinale*, which has racemes of bright red flowers.

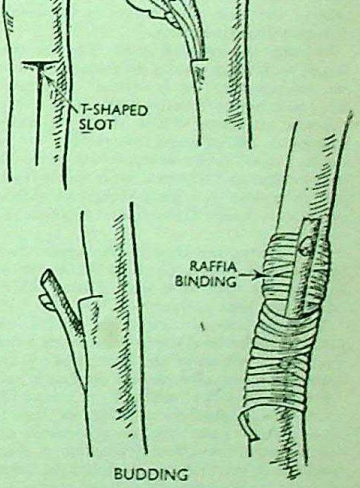
PRICKLY THRIFT.—*See* ACANTHOLIMON.

PRIMROSES (Primulaceæ).—Of the many genera of the primrose family the genus *Primula* is the most popular. It contains a great variety of species and hybrids. Primulas are suitable for greenhouse and rock garden and also for spring bedding. The Chinese Primulas are very good for pots. By making sowings at intervals in spring in a greenhouse it is possible to get a succession of bloom. *Pot culture* The plants thrive in a cool house or frame in the summer, and should be kept cool and moist in dry weather. Place singly, first of all, in 3-in. pots, and later transfer to 5- or 6-in. pots. The best compost is a mixture of three parts loam, one part leaf mould, dried cow manure and sand. *Increase:* Hardy species are raised from seeds in most cases. The seeds should be sown in a frame or greenhouse, as soon as ripe, or in spring. Those of tufty habit may be divided, when established, in spring.

BEST TO GROW.—Rock garden: "Bird's Eye Primrose," purple and yellow eye 9 in. high; *P. japonica*, crimson, 18 in.; *P. sikkimensis*, yellow flowers in summer. 2 ft. high.

Greenhouse species: *P. sinensis*, red, white, mauve, 1 ft. *P. malacoides*, pink, mauve, white, 18 in.

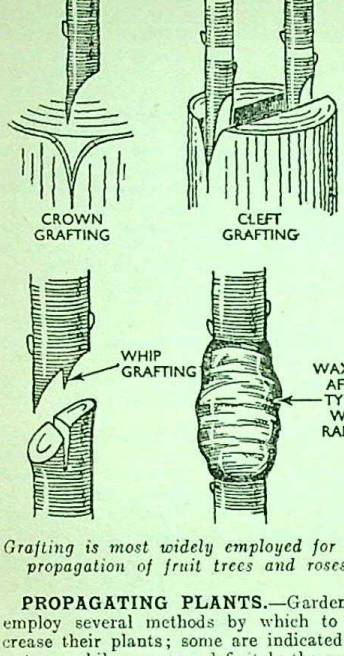
For the border: *P. vulgaris*, primrose, raised from seed in spring; *P. Auricula* (Auricula), raised from seed in spring: *P elatior* (Oxlip), raised from seed in spring; *P. officinalis* (Cowslip), raised from seed in spring. *See* AURICULA.



Budding is practised chiefly with roses, and it is a satisfactory method of introducing new varieties on to the old stocks of fruit

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Grafting is most widely employed for the propagation of fruit trees and roses

PROPAGATING PLANTS.—Gardeners employ several methods by which to increase their plants; some are indicated by nature, while some are definitely the result of man's experimenting.

Propagating by seed is the method employed to a large extent by nature, and is recommended for the gardener. Buy good seed, and buy fresh each year. Sow hardy annuals or plants which come naturally from seed, out of doors, where they are to bloom. Half-hardy annuals are sown in boxes either in the frame or in gentle heat and transplanted. Some trees and shrubs can also be raised from seed if sown in the cold frame.

Fern spores are treated like seed. Sow the spores on pieces of turf in shallow pans, and set the pans in a bed of moss which should be kept moist.

To save home-grown seed, spread the pods on paper in a sunny place, and when really dry, rub away the pods, leaving the seeds to be carefully labelled for future use.

Propagating by cuttings is employed when it is desired to raise plants true to type. Most plants root best if cuttings are taken just below a leaf joint, but in some cases, such as Willow, it should be taken between two leaf joints (internodal cuttings). Shrub cuttings should be taken with a little of the main branch adhering (a heel). Some cuttings in light, sandy soil, keep moist, and shade from bright sun. Cuttings which need heat can be placed in the greenhouse or out of doors in August.

Root cuttings are possible with some flesh-rooted plants. Lift plants such as Anchusa in late summer, and cut finger-like portions from the roots. Planted in the border, each will make a fresh plant.

Leaf cuttings can be made with fleshy leaves such as the Begonia. Make notches in the veins and peg the leaves down on sandy soil in boxes. Keep the soil moist. When new leaves appear, divide up the old leaf which will have small, rooted plants on it. Pot up the young plants singly.

Budding, a method by which new varieties can be grown on an older plant. Take a shoot bearing a bud in the axil of its leaves, and keep moist until required (scion). With the budding-knife make a T-shaped cut in the bark of the old plant (stock). Bush roses are budded at the base, standards about 5 ft. up the stem. Lift the bark slightly and slip the bud with its portion of adhering bark, from which all leaves and wood have now been removed, into the T-shaped slot. Bind with raffia, leaving the tip of the bud exposed. If swelling occurs, the operation has been successful, in which case the raffia should be loosened. Remove all buds on the stock below the new bud and cut off all the branch beyond the new bud.

Division of roots is employed with almost all herbaceous perennials, and should be done in the autumn or spring. Use sharp, clean tools, either a knife or spade, and replant the outer edge of the clump. These will form stronger plants than the worn-out centre.

Grafting is very similar to budding, but a whole shoot is transferred instead of a single bud. Cut grafts from one-year-old wood in January and keep in moist soil until March. Whip grafting consists of making a slanting cut in both graft and stock, fitting them exactly together so that the cambium layers meet, and binding with raffia, finally sealing with grafting wax to exclude air. Sometimes a tongue is made in addition to the plain, slanting cut. This is more effective but requires greater skill in execution. Old trees are sometimes cut right back and one or more grafts inserted. This is cleft grafting. Saddle and rind grafting are two alternative methods, differing only in the shape of the cut. Grafting is used largely with fruit trees and is a quick and effective method of increasing stock.

Layering occurs naturally in the case of Strawberries, which send out runners which produce roots, forming new plants.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Place open, sandy soil round the parent plant and then bend down a side shoot from which the leaves have been removed. Make a slanting cut in the stem and peg it down into the soil. It will then grow, drawing nourishment from the parent plant until roots form, when it may be detached, usually after six weeks. Climbers, shrubs, rock plants and Carnations can be increased in this way.

Ringing can be practised with room plants which have grown leggy and unsightly. With a sharp knife cut away, in a circle, the outer layer of the stem of plants such as the Castor Oil plant (*Aralia*). Cover this with Sphagnum moss, and place a flower pot slit in half vertically round the stem, wired to be on a level with the cut. Place some more Sphagnum moss in the pot, and when roots develop the top part of the plant can be cut away and repotted with its fresh roots, leaving the old plant to grow a fresh crop of leaves.

PRUNELLA (Labiatæ).—Hardy herbaceous perennials. *Soil:* Ordinary light, rich. Plant in spring or autumn and lift and replant biennially. *Increase:* By division.

PRUNING. — Pruning is an operation which depends upon the type of plant. We prune roses to restrict the size of the bush, to obtain better blooms, and in the case of fruit the object is to encourage the formation of fruit buds.

In the case of trees that are grown against walls or as cordons or espaliers, the object is to limit growth.

In the case of shrubs we prune to obtain more shapely growth and to encourage a greater production of flowers.

There are no hard and fast rules for pruning. The times for pruning in a general way may, however, be given as follows:

STANDARD AND BUSH ROSES.—End of March or first week in April.

RAMBLERS.—Cut away the old wood immediately after blooming.

SHRUBS. — Some shrubs, such as Forsythia, are pruned immediately after flowering. Others, such as *Buddleia variabilis*, are cut back in February.

FRUIT.—In the case of fruit, it should be remembered that some apples fruit on the ends of young shoots. Black currants fruit on the young wood. White currants and gooseberries usually fruit on little spurs on the old wood. Loganberries fruit on the young shoots. The old growth should be cut away after fruiting.

These peculiarities of different trees and shrubs show how necessary it is to study the habits of each species of plant.

PRUNUS (Rosaceæ).—Included in this genus are peaches, almonds, apricots, plums, cherries, laurel, etc. *Soil:* Deeply-dug, rich. Plant in October or November and prune by cutting out dead wood. *Increase:* By seed, by budding, or by grafting, according to type.

BEST TO GROW.—*P. Amygdalus*, the Almond, gives a wealth of pink flowers before the leaves have opened. 20-30 ft. *P. A. dulcis*, the edible Almond. *P. Persica* is best grown against a wall in a warm position. There are some lovely flowering varieties of both the Peach and the Almond, which is hardier than the Peach. *P. cerasifera*, the Myrobalan or Cherry Plum, is attractive in spring when the leafless branches are covered with small, white blossoms. This, with its varieties such as the Purple Leaf Plum, makes good hedging trees. *P. Padus*, fragrant white flowers in April.

PSORALEA, Scurvy Pea (Leguminosæ) —Evergreen flowering shrubs, grown chiefly in the greenhouse. Cultivated in warm districts in the open ground. *Soil:* Compost of sandy peat and fibrous loam. Pot in February or March and stand in a sunny greenhouse. Well-drained place essential. *Increase:* By cuttings of firm shoots, 2-3 in. long, inserted in moss and pure sand; stand the pots in shady part of the greenhouse.

Prune into shape early spring.

PTEROCARYA, Wing Nut (Juglandaceæ).—Hardy deciduous ornamental trees, having long, slender spikes of small nuts. *Soil:* Deep, loamy soil, fairly moist. *Increase:* By seeds sown 1 in. deep in the open during March and by layers in spring. Also by cuttings of ripened wood in September or October.

BEST TO GROW.—*P. caucasica*. Suitable for swampy ground. Leaves about 2 ft. long. 50-100 ft.

PUERARIA (Leguminosæ). — Rapid-growing climber. *Soil:* Mixture of loam and peat. *Increase:* By seeds and cuttings. Indigenous to China and Japan, *P. thunbergiana* has purple flowers and is half-hardy.

PUMPKINS (Cucurbitaceæ).—When not required for food many of the Gourds and Pumpkins are admirably suited for covering arches and trellis on account of their rapid growth, large flowers and ornamental fruits. *Soil:* Any good soil so long as a good supply of water is available in dry weather. A hole should be dug and filled with well-decayed manure, firmly trodden down and covered with 6 in. of good, light soil. *Increase:* By seeds sown singly in small pots of light soil in a temperature of about 60° in early spring. When well rooted they should be potted on into 5-in. pots of good soil. Harden off in cool house and cold frame until ready for planting out towards the end of May.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BEST TO GROW. — "Yellow Hundredweight," "Turk's Cap," "Green Giant," and "Hubbard's Squash." *See also under* GOURDS.

PUNICA (Lythraceæ).—Handsome deciduous trees or shrubs, up to 25 ft. high. This tree has very lovely foliage and red blossoms in summer and autumn, followed by round, golden-red, juicy fruits. *Soil:* Loam, leaf mould and grit. Plant against a south wall. Flowers and fruit are borne on tips of previous year's growth, so prune weak shoots only. *Increase:* By seeds, grafting and cuttings.

PYRACANTHA, Fire Thorn or Evergreen Thorn (Rosaceæ).—Beautiful hardy evergreen bushes or climbing shrubs which bear white flowers from May to June. *Soil:* Any good light loam in sunny position and a position against walls and fences. Plant in April or October. *Increase:* Either by seeds sown when ripe, or by cuttings in summer.

BEST TO GROW.—*P. angustifolia* (*Cotoneaster angustifolia*). Narrow leaves. Clusters of orange-yellow fruits throughout the winter. 10-12 ft. *P. coccinea.* Bright, coral-red fruits. 10-15 ft. *P. Gibbsii.* Fruit or berries of vivid scarlet, retained until March. *P. Rogersiana.* Orange-red berries retained until turn of the year. This species is of bushy habit.

PYRETHRUM, *Chrysanthemum coccineum.*—Hardy perennials now included under the genus Chrysanthemum. Excellent for cut flowers in early spring and autumn. Valuable insecticides are made from Pyrethrum. *Soil:* Cool, light, fairly rich. Plant in sunny position. Well-rotted manure should be added. *Increase:* By splitting up the clumps when they start growing, which may be at mid-winter. They grow 2 ft. high.

BEST TO GROW. — Named varieties: "Margaret Moore," bright scarlet; "Princess Marie," soft pink; "Hamlet," red.

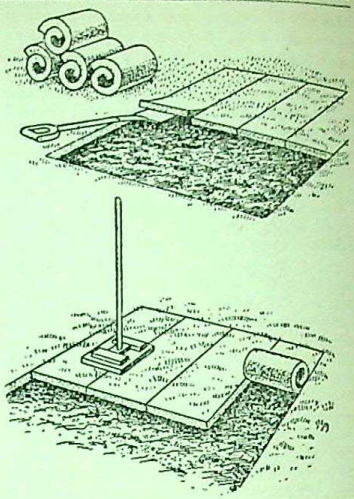
PYRUS.—*See* FRUIT AND ITS CULTURE, APPLES, PEARS, ETC.

Q

QUERCUS.—*See* OAK

R

RADISH, *Raphanus sativus* (Cruciferæ). —Slightly tender plants grown as annuals for the sake of the crisp roots. Sow in shallow drills 6 in. apart, or broadcast the seed and lightly rake it in. Seedlings should be thinned to 3 in. apart when 1 in. high. Radishes can be sown outdoors all the summer. The best way to raise an all-the-year-round crop is to use a hotbed for winter. In Public Supplies. The



CUTTING, LIFTING, AND LAYING TURF

When altering a garden design, lawns can be moved from one part to another if these directions are followed. A lawn from turf may be used sooner than one from seed

varieties listed as "winter radishes" should be sown in July and August, lifted when mature, and stored in sand like other root crops.

RAMONDIA (Gesneriaceæ). — Hardy perennials suitable for the shady side of the rock garden. *Soil:* Good, sandy loam and peat. *Increase:* By seeds or division.

RANDOM PAVING. — Rectangular pieces of stone laid in a random fashion, that is, not coursed. *See* PATHWAYS.

RANUNCULUS (Ranunculaceæ). — Hardy annuals and perennials. *Soil:* Deep, rich loam for the border species, sand and leaf mould for the alpines. *Increase:* By seeds, perennials by division after the plants have been left undisturbed for several years. Tuberous-rooted species are planted with the claws downwards, 2-3 in. deep, and the same distance apart in early spring.

RAOULIA (Compositæ). — Rock plants that form compact mats of tiny foliage, useful for covering bulbs. *Soil:* Well-drained and dry, in a sunny place.

RAPHANUS SATIVUS.—*See* RADISH.

RAPHIOLEPIS, Indian Hawthorn (Rosaceæ).—Evergreen shrubs, fairly hardy with scented flowers. *Soil:* Loam, or loam and peat, with sand. *Increase:* By cuttings. These plants are best in seaside districts

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RASPBERRY, *Rubus Idæus.*—Requires a rich soil. Plant in October in rows 5-6 ft. apart, against wires stretched between stakes. Place plants 3 ft. apart in the rows. Prune newly-planted canes to within 4 in. of the ground. In following years prune away previous year's growth in October. Propagation by suckers or offsets.

RED BUD.—*See* CERCIS.

RED HOT POKER.—*See* KNIPHOFIA.

REHMANNIA (Scrophulariaceæ). — Half-hardy perennials which flower within nine months of seed sowing. *Soil:* Loam, leaf mould and sand enriched with old manure. *Increase:* By seeds sown in autumn or early spring, in 48 or 32-size pots.

REINWARDTIA (Linaceæ). — Stove evergreen shrubs of dwarf habit. *Soil:* Loam, leaf mould and sand. Syringe twice daily from spring to autumn. Give stimulants while in flower and nip off the young shoots in June to encourage bushy growth. *Increase:* By cuttings. The flowers are yellow in autumn or winter.

RESEDA, Mignonette (Resedaceæ). — Hardy annual, biennial and perennial herbs. The best for the garden is the old favourite *R. odorata*, grown as an annual. Sow outside in ordinary soil with some lime rubble added. Thin out to 12 in. apart. Under glass sow in spring or autumn in a compost of two parts loam, one part manure and some sand. Pinch back the plants to create bushy growth. *See* MIGNONETTE.

RESURRECTION PLANT, *Anastatica hierochuntica* (Cruciferæ). — An annual plant that contracts its branches into a round ball. In this condition it is blown over the sand of the desert, and if it alights on water it opens out again as if it were still growing. This gives it the name "Resurrection Plant." Seeds can be sown in gentle heat, pricked off and transplanted to any common soil.

RHAMNUS (Rhamnaceæ).—Evergreen and deciduous shrubs with ornamental berries. *Soil:* Ordinary. *Increase:* By seeds or layers.

RHAPHITHAMNUS (Verbenaceæ). — Evergreen shrubs suitable for the seaside. *Soil:* Deep loam. *Increase:* By cuttings or seeds. The flowers are pale blue in April and May, succeeded by blue berries.

RHODANTHE (Compositæ). — Daisy-like everlasting flowers in shades of rose. *Soil:* Sandy. *Increase:* By seeds sown outdoors in April, or under glass in March. 12-18 in. *See* EVERLASTING FLOWERS.

RHODOCHITON (Scrophulariaceæ).—Greenhouse evergreen climbers. *Soil:* Loam, leaf mould and silver sand. Pot March to May. Prune moderately in February. *Increase:* By seeds in March, or cuttings in summer.

RHODODENDRON (Ericaceæ).—Greenhouse and hardy evergreen and deciduous flowering shrubs. The genus Azalea should now be included with the Rhododendrons, but is dealt with under the heading Azalea, by which name it is popularly known. An extraordinarily large number of Rhododendrons belonging to all kinds of species are now grown in gardens, though still the most popular are the various hybrids, that are descendants of *Rhododendron ponticum*. These and most of the other species all require a soil that is lime-free. In fact, so particular are some kinds of Rhododendrons on this point that the watering of a new variety with hard water from a tap may be sufficient to kill it. It is therefore only advisable to plant Rhododendrons where the natural soil of the district is lime free.

The importation of fresh soil into a district where the subsoil is of chalk is not sufficient to ensure the health of the plants, as if the roots reach the chalk the plants will suffer. The majority of tall kinds of Rhododendrons need sunshine for the production of flowers, and practically all the dwarf species are best grown on sunny rockeries. When preparing the soil for the reception of new plants, use plenty of leaf mould and well-rotted manure. Keep the ball of soil round the plant roots intact when planting, as Rhododendrons suffer considerably from damage to the roots.

The best time to plant is in September while the soil is still warm.

Pruning is rarely necessary in the case of Rhododendrons, except for the removal of dead flower heads. More drastic pruning usually means the loss of one season's flowers, but it will not harm old, straggly bushes to be cut back severely, and the flowers the second season afterwards will be much finer. *Increase:* Seeds are the easiest method of increasing Rhododendrons, and germinate easily if sown in granulated peat moss and sand. This is better than ordinary soil, as the seedlings grow more uniform, more sturdy, and are weed free. The seed-pans should be covered with glass and shaded until germination has taken place, which should be some time under a month.

RHODOTYPOS (Rosaceæ).—Deciduous shrub with pure white flowers, from May to July. *Soil:* Ordinary. Plant in autumn. *Increase:* By cuttings, suckers, or layers.

RHŒO (Commelinaceæ). — Greenhouse herbaceous perennials. *Soil:* Equal parts loam, leaf mould and sand, in baskets suspended from the greenhouse roof. Partial shade. *Increase:* By cuttings.

RHUBARB, *Rheum hybridum.*—A perennial plant grown for the edible stalks.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

There are also ornamental rhubarbs, grown generally in semi-wild gardens for the sake of their luxuriant foliage. *Soil:* Light, deep, rich, in partial shade. But Rhubarb will grow in almost every soil if well fed. Plant in February or March, single crowns being placed 1½ ft. apart in groups of three, allowing at least 5 ft. between the groups. Do not pull any stalks the first year after planting. To force Rhubarb for early supplies, lift a few roots in the autumn, when growth ceases. Leave them exposed to the air for a few days. Then pack them into large boxes, or beds in the greenhouse under the stages, with enough soil between them to separate the roots. Stalks will be ready for cutting in four to six weeks. *Increase:* By seeds, which take two years to form plants from which a crop can be gathered. Or by division of the roots, being careful to have a bud, portion of the root, and a few fibres on each piece. Such pieces can usually be taken from a large plant, *in situ*, without disturbing the whole root.

RHUS (Anacardiaceæ). — Deciduous shrubs or trees grown for the sake of their vivid autumn foliage. *Soil:* Ordinary, without manure. Better colours occur on poor soil. *Increase:* By seeds, cuttings, or root cuttings.

RIBES (Saxifragaceæ).—Currants and gooseberries (*see* FRUITS). Many species are grown as ornamental shrubs. *Soil:* Ordinary. *Increase:* By cuttings or seeds.

BEST TO GROW.—*R. aureum*. Yellow aromatic (clove) flowers. *R. sanguineum*, the red-flowering currant, and a redder form, *R. atrosanguineum*. *R. speciosum* "Fuchsia Gooseberry," 10 ft. high and wide. Crimson, pendent flowers in April and May.

RICHARDIA.—*See* ARUM LILY.

RICINUS.—*See* CASTOR OIL PLANT.

ROBINIA (Leguminosæ). — Deciduous trees and shrubs with pendent racemes of pea-shaped flowers during summer. *Soil:* Light, well-drained, in sun and shelter. *Increase:* By seed and grafting.

ROCHEA (Crassulaceæ). — Greenhouse succulents. Allied to Crassula. *Soil:* Loam, brick rubble, river sand, and dried cow manure. Pot in March, and stand near the glass. Cut back to 1 in. after flowering, and repot again when the new shoots are 1 in. long. *Increase:* By seeds or cuttings.

BEST TO GROW.—*R. coccinea*, scarlet, July, 1 ft. *R. odoratissima*, pink, June, 1 ft.

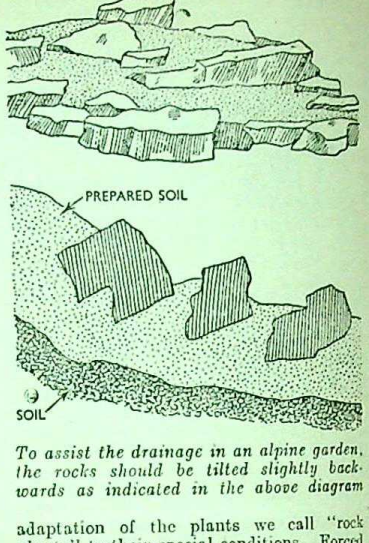
ROCK CHAMOMILE.—*See* ANTHEMIS.

ROCK CRESS.—*See* AUBRETIA.

ROCKET, SWEET.—*See* HESPERIS.

ROCK JASMINE.—*See* ANDROSACE.

ROCK PLANTS.—Long centuries of evolution are evident in the remarkable



To assist the drainage in an alpine garden, the rocks should be tilted slightly backwards as indicated in the above diagram

adaptation of the plants we call "rock plants" to their special conditions. Forced by the crowding of other vegetation to higher altitudes, they have gradually become dwarfed, partly due to lack of nourishment, but more probably because plants of lower stature are less damaged by the sweeping winds of alpine regions. They have learned to send their roots far down into the soil, below or between the rocks. They have acquired the habit of flowering very quickly at the approach of warm days, since the summer is naturally a short one on the mountain tops.

In the matter of soil we must also be watchful. Those plants that grow naturally among limestone rocks must be provided with lime in the form of mortar rubble, or builder's lime. Sharp grit must be added to the soil of most of the rock pockets, to ensure that moisture does not collect. This is partly because most natural alpine pockets would be well drained, and even more because our climate is wetter in the cold weather, and this rather encourages "damping off," which is greatly to be dreaded in the rock garden. Cloches over delicate plants in foggy weather and pieces of glass arranged to keep off heavy rains must be provided.

Apart from these points, the making of a rock home for alpine plants depends on circumstances and individual taste. Fuller details of the requirements of most rock plants are given under the generic name of each, and should be referred to by each grower according to his own requirements.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ROMNEYA, Californian Tree Poppy (Papaveraceæ).—Evergreens, suitable for the greenhouse, or a sheltered position outdoors. *Soil:* Open loam, with plenty of moisture. Plant out from pots in March. *Increase:* By seeds, root cuttings, and young shoots from the base.

ROOM PLANTS.—To those who possess the "green finger," the cultivation of plants in the house presents little difficulty. The real secret is probably affection, for those who love their plants and watch them regularly cannot fail to notice how they respond to different treatment, and will quickly learn when a plant is ailing. A few general rules may, however, be laid down for the guidance of the novice.

Most room plants like sunlight, and if the room is on the dark side, the plants should be given a change occasionally, giving them a place on the greenhouse shelves if possible, and if not, standing them in the window where they will receive the sun's rays. Aspidistras, Aralias (Fatsias) and Hart's Tongue Ferns are three of the best for complete shade.

Sufficient moisture, but not too much, is another necessity. You can tell if a plant has dried out in the pot by tapping the pot side. If it sounds dull, moisture is still present, but a hollow ring indicates dryness. All plants need more water, more air, and more sunshine when they are in full growth, and most plants have a definite resting period, during which they may, or may not, die down. In any case, water should be gradually withheld during the rest, and increased again when new growth should begin. The resting period varies, but for ferns and foliage plants it is usually the winter season. Bulbs grown indoors are coming into full growth in the middle of the winter, and will need ample water supplies and warmth.

ROSCŒA (Scitaminaceæ).—Hardy and half-hardy dwarf perennials. *Soil:* Sandy loam at the foot of a south wall. *Increase:* By division in spring.

ROSE CAMPION.—*See* AGROSTEMMA.

ROSES, *Rosa* (Rosaceæ).—A large genus that is found in almost all countries of the world, and has been known since the remotest periods of history. *Soil:* It used to be popularly supposed that clay was necessary for the cultivation of good roses. It is still true that roses like a good stiff loam, but the modern hybrids certainly prefer ordinary good, well-cultivated loam to sticky clay. For the cultivation of all kinds of roses the soil preparation can be the same. Sticky clay should be dressed with finely-sifted ashes, bonemeal, and strawy manure, and the soil should be dug to a depth of 3 ft. before planting. Light soil need not be dug quite so deeply, but its texture must be improved by the addition of heavy manure, leaves, the contents of the compost pit, and if possible, some heavier loam or clay. In addition to this, the soil must be dressed with lime, which can be applied to the surface after digging, at the rate of 2-8 oz. per sq. yd. according to the natural condition of the soil. Rose planting is best done in late autumn or early winter. The plants have time to establish themselves in the soil before the growing season, and there are always fewer losses among autumn-planted roses than among those planted in spring. It is, however, more important to get the soil into good condition before planting, and if soil preparation cannot be undertaken until autumn it would be best to defer planting until February or March. For method of planting *see* SHRUBS AND TREES.

Pruning.—It is hardly possible in a small space to deal adequately with the details of pruning, and amateurs who grow roses on a large scale are advised to get in touch with the National Rose Society, which supplies its members with detailed instructions on these points. The following may, however, be taken as a general guide:

Bush Roses.—These are usually pruned during the last week of March and the first week of April, leaving the more tender varieties until last. If they are pruned earlier, new growths begin to develop before the frosts have disappeared and may easily be damaged. The stronger a rose is growing the less pruning should be done. First thin out weak wood and cut away all wood that is dead, removing the whole of the stem in each case. Now cut back any branches that cross each other, or that crowd the centre of the bush, so that the bush is symmetrical in shape and every branch is exposed to the air and sunshine. Finally, cut back the remaining branches to one-third or two-thirds of their length according to whether they are weak or strong.

Standard Roses.—Are pruned in exactly the same manner, except that no cut should ever be made below the point at which the bush is budded. (The stem of the standard rose is generally a briar and not a modern hybrid.) Suckers arising from the base of a standard should be immediately removed, and so also should any shoots that may develop on the lower part of the main stem.

Dwarf polyantha Roses are pruned less drastically than the other types, old flowering wood being removed or shortened.

Climbing Roses are pruned in one of two ways, according to type. If the new growths spring from the base in long stems, as in the case of "American Pillar,"

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the whole of the old wood can be removed and the new shoot tied in its place. This is best done immediately after flowering. If the climbing rose does not develop new shoots from the base, but grows new stems from the existing main stems, pruning must be restricted to the removal, as far as possible, of the old flowering wood, leaving sufficient new stems to cover the supports. Climbing roses that are climbing varieties of hybrid teas are best not pruned until spring. Pruning will be somewhat on the lines of bush roses, except that the tall main stems will be allowed to remain, and only the flowering stems cut back. New growths from the base will be gradually encouraged to take the place of worn-out stems.

ROSMARINUS, Rosemary (Labiatæ).—Hardy evergreen shrubs, suitable for old-world gardens, herb gardens and mixed borders. *Soil:* Well-drained, light loam, in a sunny position. *Increase:* By seeds, layers and cuttings.

RUDBECKIA.—*See* CONE FLOWER.

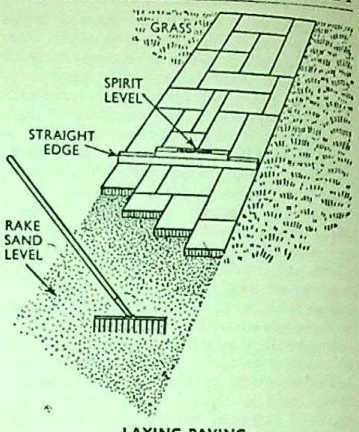
RUMEX, Sorrel (Polygonaceæ).—Hardy perennials. *Soil:* Almost any soil is suitable for these plants, which, when once established, grow almost like weeds. They do, however, like a good deal of moisture, some of the species being treated as aquatics. *Increase:* By seeds sown in March and transplanted in April to 1 ft. apart. Also by division.

S

SAGITTARIA, Arrow Head (Alismaceæ). — Stove, greenhouse and hardy aquatics. For cultivation *see* WATER PLANTS.

SAINTPAULIA (Gesneraceæ).—Greenhouse perennials. *Soil:* Loam, leaf mould, peat and sand in equal proportions. Minimum temperature 50°-60°. *Increase:* By seeds sown in spring. The flowers are violet in colour and are commonly called "African Violets."

SALADS. — The cultivation of good salads is a test of a gardener's skill. The secret is to keep a continuous growth—without any check—from the time the seed is sown until the plants are ready for table. For this, warmth, moisture and adequate food supplies are required. Anybody can grow good salads in well-cultivated ground during the summer. Failures at this season are usually due to periods of drought. Salads suffer more than most crops, unless they can be well supplied with water. Deep digging, which allows the plants to use moisture from a considerable depth in the soil, will make a big difference. For the production of salads at other seasons, the use of a hot-bed or artificial heat in the frame or greenhouse is essential. *See also* HOTBED and GREENHOUSE.



LAYING PAVING

Paving should be laid on a two-inch layer of sand, firmly rolled and raked level. Use a straight edge and spirit level in order to achieve the greatest accuracy

SALIX, Willow (Salicaceæ). — Hardy deciduous and evergreen shrubs and trees suitable for damp situations. *Soil:* Moist loam. *Increase:* By seeds or cuttings. Willows are particularly easy to increase by cuttings as any piece when broken off and pushed into the soil will root. For this reason willows are used to bind sandy banks and land that is liable to slide. For this purpose stakes 6-8 ft. long are driven into the ground at right angles to the slope of the bank. Roots quickly form and bind the soil. Willow provides canes for basket weaving and one variety produces the wood used in the manufacture of cricket bats.

SALPIGLOSSIS (Solanaceæ). — Half-hardy annuals, excellent for summer bedding. *Soil:* Ordinary, light, or a compost of loam, leaf mould, rotted manure and a little mortar rubble and sand. *Increase:* By seeds sown in March for bedding plants, and planted out in June; or if they are to be kept in the greenhouse or conservatory they may be sown in August or September. There are many new varieties of very fine colouring, including purple and gold, scarlet, rose and white with gold stripes, light-blue, violet, soft red and yellow, edged with white.

SALSIFY, *Tragopogon porrifolius* (Compositæ).—"The Vegetable Oyster." This vegetable is not very popularly cultivated, although the leaves are excellent in salads.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and the tender roots make a fine boiled vegetable. *Soil:* Light, deep, rich. *Increase:* By seeds sown in spring in drills 1 ft. apart. As these plants are easily checked by transplanting, they should be sown where they are to mature; they must, however, be thinned to a distance of 4 in. apart when a few inches high. In October the roots may be lifted and stored in dry sand until required for use.

SALVIA (Labiatæ).—(*For* SAGE, *see* HERB GARDEN.) Annuals, biennials, and perennials, some hardy and others useful in the greenhouse. Some are grown as bedding subjects. *Soil:* Two parts loam, one part coarse sand, with leaf mould and manure for pot plants. Ordinary light soil for outdoor plants. *Increase:* By seeds and cuttings.

SAMBUCUS, Elder (Caprifoliaceæ).—Deciduous flowering shrubs with white flowers. *Soil:* Moist loam, will grow well on chalk. *Increase:* By cuttings of half-ripened wood.

SAND.—A sandy soil is generally regarded as poor, but some plants thrive very well in sand. A soil that is very heavy and not well drained is usually assisted by the addition of sand.

In addition to its use in potting composts, sand can be used for making up garden paths, for the water garden, and many other purposes. Sand is also used for storing root crops such as carrots, parsnips, leeks, etc.

SANGUINARIA (Papaveraceæ).—Hardy perennial, suitable for the rock garden or border. *Soil:* Moist, sandy peat. *Increase:* By division or seeds. The flowers are white and appear in April and May. The essence from the roots of Sanguinaria is used by doctors for lung troubles.

SANTOLINA, Lavender Cotton (Compositæ).—Hardy and half-hardy evergreens with small, yellow flowers. *Soil:* Ordinary. *Increase:* By cuttings or seeds.

SANVITALIA (Compositæ). — Trailing annuals suitable for edging or for growing in the rock garden. *Soil:* Ordinary. *Increase:* By seeds sown in April. The flowers are yellow with a black disk, and the plants are 6 in. in height.

SAPONARIA (Caryophyllaceæ).—Hardy and half-hardy annuals and perennials, suitable for the border or rock garden. *Soil:* Ordinary light, in a sunny position. *Increase:* By seeds and division. Also by cuttings

SARCOCOCCA (Euphorbiaceæ).—Low-growing evergreen shrubs, with fragrant white flowers and blue-black or scarlet berries. *Soil:* Ordinary moist. *Increase:* By cuttings.

SARMIENTA (Gesneraceæ). — Greenhouse evergreen creeper. *Soil:* Soft peat charcoal and chopped Sphagnum moss, in teak hanging baskets. Plant in March. *Increase:* By seeds, cuttings or division.

SARRACENIA (Sarraceniaceæ).—Half-hardy insectivorous perennials. *Soil:* Moist, fibrous peat and Sphagnum moss in a sunny position. Good drainage is essential. *Increase:* By seeds or division.

SASSAFRAS (Lauraceæ). — Hardy deciduous trees, originally from U.S.A., where scent and dye are extracted from the fruits and wood. The leaves are used for soups, and beer is made from the young shoots. *Soil:* Well-drained in a sheltered position. These trees strongly object to the presence of lime in the soil. *Increase:* By seed.

SATUREIA, Savory.—*See* HERB GARDENS.

SAUROMATUM (Aroideæ).—Tuberous-rooted hardy and stove perennial. *Soil:* Loam, peat and sand, and plenty of water. *Increase:* By offsets. The flowers will appear indoors if the tubers are placed in a saucer for a few weeks. When the flowers fade the tubers should be planted in the open ground.

SAVORY.—*See* HERB GARDENS.

SAVOY.—*See* CABBAGE.

SAWFLY.—This group of flies will, if not checked, eat away the leaves of the plants they attack. *See* PESTS AND DISEASES.

SAXIFRAGA (Saxifragaceæ). — These are most popular plants for rockeries and dwarf walls.

Of several distinct sections the *Kabschia* section, with compact cushions of grey or green and usually lime-encrusted foliage, is the most popular. They like a gritty soil of loam, leaf mould and limestone chips, and succeed well in a moraine.

SCABIOUS (Dipsaceæ).—Hardy annuals and perennials suitable for the borders, or the rock garden, and also excellent for cutting. *Soil:* Ordinary, rich, in sun or semi-shade. Plenty of moisture needed in hot weather. *Increase:* By seeds. Perennial species also by division.

SCARBOROUGH LILY.—*See* VALLOTA.

SCHIZANTHUS (Scrophulariaceæ). — Half-hardy annuals. *Soil:* Loam, leaf mould and sand. *Increase:* By seeds sown in pots in September. As the seedlings develop they should be pricked off into larger pots. They should be grown as cool as possible, only giving enough heat to exclude frosts. Stake with green bamboos.

SCHIZOPETALON (Cruciferæ). — Hardy annuals that are fragrant in the morning and evening, and also after light rain. *Soil:* Moist, sandy loam, in the semi-shade. *Increase:* By seeds sown under glass in March, or in the open in April.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SCHIZOSTYLIS, Kaffir Lily (Iridaceæ). — Hardy and greenhouse bulbous-rooted perennials. *Soil:* For outdoor culture a moist loam is best, but if the bulbs are to be cultivated in the greenhouse a compost of loam, decayed manure and sand should be prepared. *Increase:* By division or offsets.

SCILLA (Liliaceæ).—Greenhouse and hardy bulbs, some species of which are often found growing wild in woodlands. *Soil:* Sandy loam, usually in a sunny position. Plant 2 in. deep and 2 in. apart, or farther apart in the case of large bulbs. They can be grown in lines for edging, or in masses, or naturalized in the turf of an alpine garden. They can also be grown in pots and bowls. *See* BULBS.

SCIRPUS (Cyperaceæ). — Perennial plants suitable for bog gardens and the margins of ponds. *Increase:* By seeds, division or suckers.

SCORZONERA (Compositæ). — *Scorzonera hispanica* is grown as a vegetable for the sake of its roots.

Sow in May in drills 1 ft. apart in ordinary, well-cultivated ground. Thin the plants to 10 in. apart, lift the roots in September, or leave them in the ground to be lifted as required.

SCUTELLARIA (Labiatæ). — Hardy, half-hardy, and stove perennials. *Soil:* Ordinary. *Increase:* By seeds and division.

SEAKALE, *Crambe maritima* (Cruciferæ).—This vegetable is not very extensively cultivated but it is well worth more popularity.

Sow the seed in open ground in good light soil in March or spring. The plants should be 6 in. apart in rows 1 ft. apart. The seedlings should be allowed to remain where they are for two seasons. After this move the plants to a permanent bed to be lifted for forcing as required, or to be forced in the open ground by covering with cloches and strawy material to exclude the light. Any ordinary soil is suitable for the permanent bed, provided it is deeply dug during the winter ready for planting in March.

A simple way to force seakale in open beds, where cloches are not available, is to cover the crowns with deep boxes, over which a foot layer of fresh stable manure is piled. If stable manure is not available, cover the crowns with a foot of coal ashes and set the boxes over these, piling on to them any available litter that will help to keep out frost.

As in the case of rhubarb, the plants should never be allowed to flower.

When lifting seakale for forcing in November or December, lift carefully, trim off the stumps and leaves and side-shoots and stand in moist sand until wanted. Force by placing five or six crowns in an 8-in. flower pot with fine soil. Water well in and place under the greenhouse stage in a temperature of 60°-65°. A second flower pot of the same size should be placed over the top, the drainage hole being blocked up to exclude the light. It takes about fourteen to twenty-one days to provide growths fit for cutting.

BEST TO GROW.—"Lily White," "Feltham White."

SEASIDE GARDENS.—Seaside conditions in the British Isles are normally warmer than inland, but at the same time winds are more violent, and the air is salt-laden. The first thing to do in making a seaside garden is to consider the question of shelter, and this having been provided, the garden will grow practically any type of plant according to the natural soil of the district.

Before planting any trees or shrubs, the condition of the soil should be taken into account. The ordinary rules for soil preparation will apply, that is to say, heavy soil will be lightened, and light soil will be made more retentive of moisture by the addition of strawy manure, leaf-mould, etc. The worst problem will be where the soil is practically pure sea-washed sand. Here the sand must be prevented from blowing about by the establishment of grasses, the erection of fences, and by the pegging down of tree branches over the surface. Scotch Roses, Willows, Common Privet, Broom and Tamarisk, with Violas and Sea Pinks, will constitute the first plantings, while trees that can be planted almost at once include the Corsican Pines, Maritime Pine and Sitka Spruce.

SEAWEED.—*See* KELP.

SEDUM (Crassulaceæ).—Hardy perennials and sub-shrubs suitable for dry borders, rockeries, etc. *Soil:* Ordinary, with some lime. *Increase:* By division or seeds.

SEEDS.—Seeds vary considerably in many ways. For one thing, some seeds will retain their vitality for many years while others lose quickly the power of germination. All seeds are the product of fertilization of plant ovules, usually by pollen brought from some other plant by the agency of wind or insects. For this reason the plants that grow from seeds may vary considerably, since they may inherit the characteristics of either parent, or even of grandparents. It is because of these variations that the best seedsmen test samples of all seeds sent out, first for germination qualities, and secondly for purity of strain. Amateurs who save their own seed will frequently find that though the germination qualities are good, some of the resulting seedlings are worthless,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but against this there is the possibility of securing a novelty of first-class quality. If seeds are saved, they should not be gathered until almost fully ripe and should be exposed to the sun for a time before storing. Store very dry, and always remember to label the container.

When raising seed, use soil, preferably sterilized, that is finely sifted, and see that it contains sufficient sharp grit to keep it open. Seeds covered with soil that cakes after rain has fallen frequently fail to germinate. The ideal compost is well-decayed leaves, ordinary garden soil and sharp sand, all passed through a fine sieve. If the seeds are to be grown under glass and there is great danger of "damping off" (a disease favoured by close conditions), the leaves should be omitted from the compost.

As a rule it is best to shade seedlings from bright sunshine for a few days after germination.

The time for sowing varies, but in the majority of cases hardy annuals are sown in the open, in autumn or spring, half-hardy annuals in early spring in boxes in the cold frame, or greenhouse, or outdoors in April or May, and perennials and biennials towards midsummer, either under glass or in the open according to whether they are tender or hardy.

All seedlings should be transplanted or thinned out very early in their growth, so that they are never, at any time, overcrowded.

SELAGINELLA, Tree Club Moss (Selaginellaceæ).—Stove and greenhouse plants resembling mosses or ferns. *Soil:* Fibrous peat and chopped Sphagnum moss. *Increase:* By cuttings.

SELENIPEDIUM. — Stove terrestrial orchids. For cultivation *see* ORCHIDS.

SEMPERVIVUM (Crassulaceæ). — Mostly hardy succulents, except those that have a cobwebby tomentum on the rosettes of leaves. These need to be covered with a glass in very wet winters. *Soil:* Dry, sandy. *Increase:* By seeds or offsets.

SENECIO (Compositæ).—A large genus of evergreen, hardy and tender plants and shrubs. *Soil:* Moist and fairly light outdoors. In pots, two parts fibrous loam, one of sand with a little leaf mould and manure. *Increase:* By seeds, cuttings or division.

SEQUOIA.—For culture *see* CONIFERS.

SERAPIAS.—Hardy terrestrial Orchids. For cultivation *see* ORCHIDS.

SHADY BORDERS. — Several points should be remembered when planting shady borders. Bring the soil into good condition by deep digging, and if the natural soil is heavy, make it warmer and lighter by adding ashes, bonemeal and lime. Some sand can also be added. Do not overdo the application of farmyard manure, but use bonemeal and superphosphate of lime instead. Choose only plants that are suitable for growing in the shade and, if the border is to match a sunny one, try to bring as much light into it as possible by the use of white and cream and lemon-yellow flowers. Some of the most valuable plants for the shady border are as follows:

Spring flowering. — Bulbs; Forget-me-nots; Columbines; Doronicums; Primulas.

Summer flowering. — Balsam; Calceolarias; *Campanula persicifolia*; Evening Primrose; *Meconopsis Baileyi*; Nicotiana; Phlox; Campanula; "Telham Beauty"; Turk's Cap Lilies; Violas.

Autumn flowering.—Anemone japonica; Helenium; Michaelmas Daisy; Solidago.

SHALLOT, *Allium ascalonicum* (Liliaceæ).—One of the most easily cultivated vegetables. *Soil:* Ordinary, but it pays to give liberal treatment. Plant firm, fair-sized bulbs in February or March in rows 1 ft. apart, spacing the bulbs about 9 in. apart. Press them into the soil to half their depth. Hoe frequently during the season and give weak doses of liquid manure after rain in May and June. Lift when fully developed in July as soon as the tops begin to wither. Dry off in the sun and store in the same manner as onions.

BEST TO GROW.—"Giant French Red"; "Giant Golden Skinned."

SHASTA DAISY. — *See* CHRYSANTHEMUM.

SHIRLEY POPPY.—*See* POPPY.

SHORTIA (Diapensiaceæ). — Hardy perennials suitable for the rockery in sun or partial shade. *Soil:* Peat or sandy loam. *Increase:* By offsets. These plants have white flowers that fade to rose as they open, and leaves of deep green that become crimson in autumn and winter. They are sometimes grown as pot plants.

SHRUBS AND TREES.—Shrubs and trees are used in gardens as windbreaks, boundaries, division screens, shelter belts, and as a background to brightly-coloured herbaceous plants. Even the smallest garden can hardly afford to be without some shrub or tree. The time to plant is while the leaves are absent in the case of deciduous shrubs, and in September or April in the case of evergreens. Deciduous trees and shrubs usually suffer less from transplanting than evergreens, the reason being that there is no loss of moisture from the surface of the leaves, and the plants can more quickly adapt themselves to the change. If evergreens have to be moved when the weather is not showery, they should be regularly sprayed with tepid water for some days afterwards, as this to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

some extent helps to restore the balance of moisture. It is not necessarily an unhealthy sign if evergreens lose their leaves soon after being moved; in fact, it is a much worse sign if the leaves shrivel and remain on the plants.

Planting Shrubs. — Whatever kind of shrub or tree is to be moved, the soil to receive it should be well prepared, as deficiencies cannot be made good in later years. Dig to a depth of 2 ft. on light soil and even deeper on sticky clay, improving the texture of the soil as suggested elsewhere. (*See* SOIL.) Open out a hole much wider and deeper than is necessary to take the roots of the plants spread out to their fullest extent. Throw in a quantity of good soil and hold the shrub or tree in position with the soil mark level with the ground surface. It is sometimes a help if a stake is driven in before the shrub is planted. This avoids damage to the roots when the stake is driven in, and also enables the planter to work single-handed by tying the plant to the stake before the roots are covered. Throw fine soil over the roots and raise and lower the plant a few times to ensure that the soil trickles between the fibrous roots. Tread this firm and fill in the remainder of the soil, again treading to make it quite firm. All shrubs and trees should be staked at planting time. In the case of rather tender evergreens and other shrubs which dislike removal, it pays to keep the ball of soil intact round the roots at planting time. Quite a large tree or shrub can be moved satisfactorily if this can be done.

Pruning.—The worst stumbling block for amateurs is in the pruning of shrubs and trees, and it is impossible to give very detailed instruction on this point in such a limited space. The general lines to follow are to watch the habit of the plant, and to consider what you want from the plant. If a tree is to provide shelter, it can be allowed to grow unchecked, so long as the growth is symmetrical and pleasing. If it is to provide fruit, or ornamental flowers, it must be encouraged to do this by limiting the amount of leaf and stem growth.

Always use sharp tools, and if you make any large cuts on either shrubs or trees, paint over their wounds with some antiseptic dressing such as tar or creosote. Cut back always to a point where the branch joins another one, as stumps left beyond a growing point will always die, and may decay and cause disease.

When fruit or flowers are to be encouraged, the aim should be to keep the trees to shapely proportions, leaving the branches so spaced that plenty of sun and air reach every part. If flower buds form naturally at the ends of twigs, these cannot be removed without a loss of flower, but if flower buds form on short spurs near the old wood, as in the case of many fruit trees, the stems beyond the buds can be cut out with advantage. Shrubs that flower on new wood, less than a year old, should be pruned well back immediately after flowering. As a general rule, however, it is better to leave a tree entirely unpruned than to prune too drastically without a knowledge of the tree's habit of growth. Even fruit trees will succeed perfectly well if pruning is restricted to the annual removal of old, dead wood and branches that cross the centre of the bush.

SIBERIAN WALLFLOWER. — *See* CHEIRANTHUS.

SIDALCEA (Malvaceæ).—Hardy perennials. *Soil:* Ordinary, well cultivated. *Increase:* By seed, root division, or cuttings.

SILENE (Caryophyllaceæ).—Hardy and greenhouse annuals, biennials and perennials. These plants are easily cultivated and are excellent for growing in beds, borders or in the rock garden. *Soil:* Light loam, with a little sand added for the rock garden species. *Increase:* By seeds and division.

SILPHIUM (Compositæ). — Hardy perennials. *Soil:* Ordinary. *Increase:* By division

SISYRINCHIUM (Iridaceæ). — Hardy and half-hardy perennials. *Soil:* Sandy loam and leaf mould. *Increase:* By seeds or offsets.

SIUM, Skirret (Umbelliferæ). — This vegetable is an old one, recently regaining popularity. *Soil:* Rich, deeply dug, and free from stones. Sow seeds in April, in drills 18 in. apart, setting them a foot apart in the row. Remove the flower heads immediately they appear. Lift in October and twist off the tops as in the case of beet. Store in sand in a cool, dry place.

SKIMMIA (Rutaceæ).—Evergreen shrubs, with attractive berries. Plants of both sexes must be grown if berries are to be secured. *Soil:* Moist loam, with peat if possible. *Increase:* By seeds or cuttings.

SKIRRET.—*See* SIUM.

SLUGS.—*See* PESTS AND DISEASES.

SMILAX, Sarsaparilla Plant (Liliaceæ). —Climbing shrubs with beautiful foliage. *Soil:* Ordinary loam. *Increase:* By division in spring.

SNAILS.—*See* PESTS AND DISEASES.

SNAPDRAGON.—*See* ANTIRRHINUM.

SNOWBERRY. — *See* SYMPHORICARPUS.

SNOWDROP, *Galanthus* (Amaryllidaceæ).—Hardy bulbs, best grown where they can remain undisturbed for years. *Soil:* Ordinary. If grown in pots use two parts ordinary soil, one part leaf mould and some sand. Lift and divide groups only when

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they are too crowded to flower. *Increase:* By offsets, or by seed, but seed takes three years to reach the flowering stage.

SOBRALIA. — Greenhouse terrestrial orchids. *See* ORCHIDS.

SOIL.—All soil has been formed by the gradual breaking down of the earth's crust, caused by the action of the weather, the decay of vegetation, and the activities of earthworms and other creatures.

The chief forms of soil with which the gardener is concerned are clay, sand, gravel, chalk, peat, and limestone and other rocks.

The difference between clay, sand and gravel is that gravel is in large pieces, or pebbles, sand in smaller but still coarse pieces, and clay is very fine powder. The fineness of the clay particles causes them to adhere, making the ground sticky in wet weather, and in very hard lumps in dry weather. The action of lime on clay soils causes the lumps to break up, and makes the soil of a more open texture, better suited to plant life. Ashes and gritty matter also help to improve the texture of a clay soil.

Chalk alone is not a suitable soil for plant cultivation, but a good loam over chalk is ideal for many subjects. The chalk allows water to pass away very rapidly, and soil over chalk is therefore inclined to be dry in summer. Gardeners should remember that though chalk and lime are practically the same thing, gardens over a subsoil of chalk need a lime dressing regularly. This is because the lime in the soil always tends to wash down into the subsoil, leaving the surface layer lime-free. Chalk does not break up stiff soil as does builder's lime, but it is an excellent substitute for lime on light soils, where it should be used at twice the rate recommended for lime.

Peat is a soil that is lime-free; in fact, it is an acid soil. It consists entirely of decayed vegetable matter and fibre, and is specially suitable for the cultivation of certain plants.

The general method of improving all natural soils, to bring them into good condition for the cultivation of flowers and vegetables, is to dig deeply, and at the same time to add those substances in which the soil is deficient. Digging is generally done by the bastard trenching method. A trench is opened first. Then the bottom is forked over, and manure thrown into the open trench. On clay soils strawy stable manure, leaves, ashes from the bonfire, grit, and road sweepings (if free from tar) are useful additions, which help to lighten the soil texture (i.e. to make it more open and porous). On light soils, heavy cow or pig manure, clay, leaves, and any decayed vegetable matter should be used. As each trench is forked and manured, fill it up with the soil taken from the next width of land, thus opening up another trench for similar treatment. Unless the subsoil of chalk is brought up as the digging is done, or plants that are lime haters are being grown, a dressing of lime should always be scattered over the soil surface after digging has been done. If the soil is turned up in a rough and lumpy condition early in the winter, and is dressed with lime and left until seed time, all the hard lumps will be found to have become soft and powdery, and ready to rake level for the reception of fine seeds.

Limestone, and other rocks not yet broken down to the condition we call "soil," are often used by the gardener in the making of rock gardens, paths, etc. Limestone rocks are ideal for most rock gardens, but their lime content should be kept in mind. Plants that naturally haunt the limestone valleys and hills will grow well among imported limestone and will generally appreciate additional lime in the soil used for the rock garden.

When preparing soil for potting, the gardener should provide himself with the following materials, which will be recognized as the ingredients of most of the special soils recommended for the pot culture of plants which are referred to in other pages:

Loam. (The surface turf from pasture or roadsides stacked for six months, makes ideal loam.) *Peat. Sphagnum moss. Leaf mould.* (Leaves stacked for six months and then passed through a sieve.) *Pieces of charcoal. Sharp sand,* river washed if possible. *Osmunda fibre.*

SOLANUM (Solanaceæ). — *See also* POTATO. Hardy and greenhouse annuals and perennials, some evergreens. *Soil:* Ordinary light loam. *Increase:* By seeds, perennials by cuttings.

BEST TO GROW.—*Solanum capsicastrum*, the popular Christmas pot plant with bright orange berries. Sometimes called "Winter Cherry."

SOLDANELLA (Primulaceæ).—Hardy perennials suitable for the rockery. *Soil:* Sandy loam, peat and leaf mould with a top dressing of leaf soil and sand in autumn. They like a position where there is plenty of moisture in the soil. *Increase:* By seeds, or division after flowering.

BEST TO GROW.—*S. alpina*, blue, 2 in., and also a white form, April.

SOLIDAGO, Golden Rod (Compositæ). —Coarse-growing, hardy perennials. *Soil:* Ordinary, in sun or shade. *Increase:* By seeds or division.

SOLLYA (Pittosporaceæ). — Tender climbers. *Soil:* Well-drained loam and peat. *Increase:* By cuttings or seeds

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SOLOMON'S SEAL. — *See* POLYGONATUM.

SONERILA (Melastomaceæ). — Stove perennials with ornamental foliage. *Soil:* Equal parts fibrous peat, chopped Sphagnum moss, charcoal and sand. Pot in February or March. *Increase:* By cuttings.

SOOT.—Soot is valuable to the gardener because it contains a little nitrogen, is a good insecticide, and by darkening the colour of the soil makes it a little warmer. As an insecticide it should be mixed with lime and dressed along the soil surface between growing crops. Always store soot dry for a time before use.

SOPHORA (Leguminosæ). — Deciduous trees and shrubs. *Soil:* Ordinary loam, in full sun. *Increase:* By seeds or cuttings.

SOPHRO-CATTLEYA.—Race of hybrid orchids, cultivated like Cattleyas. *See* ORCHIDS.

SOPHRO-LÆLIO-CATTLEYA. — Trigeneric hybrids, becoming very popular, cultivated like Cattleyas. *See* ORCHIDS.

SOPHRONITIS. — Greenhouse epiphytal orchids. *See* ORCHIDS.

SORREL.—*See* RUMEX.

SOUTHERNWOOD.—*See* ARTEMISIA.

SPARAXIS (Iridaceæ). — Half-hardy bulbs. *Soil:* Light and sandy in full sunshine. Plant from September to January 4 in. deep and 2 in. apart. They may also be grown in pots. *Increase:* By offsets.

SPARMANNIA (Tiliaceæ).—Greenhouse evergreens. *Soil:* Two parts loam, one part peat, with a little sand. Prune moderately in November or December. *Increase:* By cuttings in spring.

SPARTIUM, Spanish Broom (Leguminosæ).—A broom-like shrub with pea-shaped yellow fragrant flowers in racemes up to 18 in. long. Flower from June to September. *Soil:* Ordinary. Hot, dry banks are suitable. *Increase:* By seeds. The plants may be pruned into shape if required.

SPATHOGLOTTIS. — Stove terrestrial orchids. *See* ORCHIDS.

SPATHYPHYLLUM (Aroideæ).—Stove evergreens. *Soil:* Leaf mould, loam, peat, sand and charcoal. *Increase:* By seeds or division.

SPECULARIA (Campanulaceæ). — Hardy annuals. *Soil:* Sow in spring in light soil where they are to flower.

SPHAGNUM.—A moss that grows in swampy places and retains moisture in a healthy condition. For this reason it is used for packing flowers and roots, and is also chopped to add to the compost for a number of greenhouse plants.

SPINACH, *Spinacia oleracea* (Chenopodiaceæ).—A wholesome vegetable which is increasing in popularity. Sow on fairly rich soil any time from February onwards to the beginning of October. At this period seeds should be sown for winter supplies. On heavy soils sow the round-seeded Summer Spinach for winter, but on other soils use the prickly-seeded or Winter Spinach. Thin the plants out to 6 in. apart to allow the foliage to develop to a good size and texture.

SPINACIA.—*See* SPINACH.

SPIRÆA (Rosaceæ).—Flowering shrubs and herbs of very varied habit of growth. *Soil:* Moist loam in sun. Herbaceous species can be grown in pots and forced if desired. *Increase:* By cuttings or by seed.

BEST TO GROW.—*S. arborea.* 20 ft. Plumes of cream-coloured flowers from July to September. *S. arguta.* Branching shrub with white flowers in April and May, easily increased by layering. *S. discolor.* Graceful, arching branches with pendulous plumes of creamy-white in July. 20 ft. Thrives best near water. *S. japonica,* "Anthony Waterer." 2-3 ft. Bright crimson. July to October. *S. trichocarpa.* 5-7 ft. Pure white. June. The leaves turn scarlet in autumn. *S. Van Houttei.* White. June. *S. aruncus.* Goatsbeard, with creamy-white plumes. *S. astilboides,* similar to *aruncus.* *S. Ulmaria flore pleno,* a fine form of the native "Meadow Sweet."

SPIRANTHES. — Stove terrestrial orchids. *See* ORCHIDS.

SPRUCE.—*See* CONIFERS.

STACHYS TUBIFERA. — *See* ARTICHOKE, CHINESE.

STANHOPEA. — Stove orchids. *See* ORCHIDS.

STAPHYLEA (Staphyleaceæ).—Deciduous shrubs, mostly hardy. *Soil:* Ordinary. *Increase:* By cuttings, suckers or seeds.

BEST TO GROW.—*S. holocarpa rosea.* 20-30 ft. Pink.

STATICE (Plumbaginaceæ). — Hardy and half-hardy annuals and perennials. *Soil:* Ordinary, preferably light, in a sunny position *Increase:* By seeds.

STAUNTONIA (Lardizabalaceæ). — Hardy and half-hardy evergreen climbing shrubs. *Soil:* Sandy. *Increase:* By cuttings.

STEPHANANDRA (Rosaceæ). — Deciduous shrubs. *Soil:* Moist loam. *Increase:* By cuttings or division.

STEPHANOTIS (Asclepiadaceæ). — Stove evergreen climbers. *Soil:* Two parts turfy loam, one part each peat and silver sand. *Increase:* By cuttings.

BEST TO GROW.—*S. floribunda Elvastons.* White, fragrant flowers.

STERCULIA (Sterculiaceæ). — Evergreen and deciduous trees and shrubs suitable for warm southern countries. The flowers are yellow, followed by podded fruits. *Soil:* Loam and peat. *Increase:* By cuttings of ripened wood in autumn.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

STEVIA (Compositæ). — Half-hardy perennials with daisy-like flowers of white, rose or violet. *Soil:* Sandy loam. *Increase:* By division. They can be grown outdoors if protected during the winter.

STIGMAPHYLLUM (Malpighiaceæ).— Stove evergreen climbers with yellow flowers. *Soil:* Peat and loam. Prune in January. *Increase:* By cuttings.

STOCK, *Matthiola* (Cruciferæ).—Half-hardy annuals and biennials, mostly grown in the open garden, though some are useful for winter decoration in the greenhouse. They are all sweetly scented. *Soil:* Good loam, with leaf mould and sand. For winter flowering, seeds should be sown in July or early August in the cold frame, and for summer they can be sown under glass early in the year, or direct in the open border later. Biennial stocks can be sown during any part of the summer to flower the following year.

BEST TO GROW.—*M. annua.* Ten Week Stocks. Half-hardy annuals. Brompton and East Lothian Stocks, half-hardy biennials. *M. bicornis,* Night Scented Stock. Of the modern named varieties suitable for pot culture, the following may be recommended. A good strain should produce a high percentage of doubles: "Old Rose"; "Summer Night," purple; "Beauty of Nice," flesh pink; "Parma Violets," mauve; "Snowdrift," white; "Christmas Pink."

STOCK, VIRGINIAN.—*See* MALCOLMIA.

STONE-CROP.—*See* SEDUM.

STRANVÆSIA (Rosaceæ).—Evergreen shrubs with hawthorn-like flowers and attractive fruits. *Soil:* Sandy loam. *Increase:* By cuttings.

STRAWBERRY, *Fragaria vesca,* is the native strawberry, which is one of the parents of the cultivated strawberry grown for the sake of the fruit. Strawberries are planted in August, October or March in any good soil, setting the plants 18 in. apart, in rows 2½ ft. apart. Mulch with straw when the flowers have set. Remove all runners from the plants unless new plants are wanted. Burn the old plants after three years and replace with new ones. *See also* FRUIT AND ITS CULTURE.

STRAWBERRY TREE.—*See* ARBUTUS.

STRELITZIA (Scitiminaceæ). — Stove herbaceous perennials with yellow flowers in spring and early summer. *Soil:* Fibrous loam with a little peat in the greenhouse beds. *Increase:* By seeds, suckers or division.

STREPTOCARPUS (Gesneraceæ). — Greenhouse perennials, usually treated as biennials. Sow in early spring in rich, open soil and pot out as required, using loam, peat, well-rotted manure and a little sand for the final compost. Autumn flowering.

STROBILANTHES (Acanthaceæ). — Stove evergreen shrubs. *Soil:* Sandy peat and loam. *Increase:* By cuttings.

STUARTIA (Ternstrœmiaceæ). — Deciduous shrubs or small trees. *Soil:* Sandy loam with leaf mould and peat. *Increase:* By seeds, cuttings or layers.

STYLOPHORUM, Celandine Poppy (Papaveraceæ).—Hardy perennial herbs. *Soil:* Ordinary, in partial shade. *Increase:* By seeds sown where they are to grow, or by root division in March.

STYRAX (Styracaceæ). — Deciduous flowering shrubs. *Soil:* Sandy loam, leaf mould or peat in a sheltered spot. *Increase:* By seed.

SUGAR PEA.—The pea of which the whole pod is eaten instead of only the seeds. For cultivation *see* PEA.

SUMACH.—*See* RHUS.

SUNFLOWER.—*See* HELIANTHUS.

SWAINSONIA, Darling River Pea (Leguminosæ). — Greenhouse evergreens. *Soil:* Fibrous loam, peat and sand. *Increase:* By cuttings. The plants are grown in pots and reach a height of about 2 ft. with scarlet, purple, white or pink flowers, in July.

SWEET CICELY.—*See* MYRRHIS.

SWEET PEA, *Lathyrus odoratus* (Leguminosæ). — Hardy annuals suitable for cultivation in the open garden, or under glass. *Soil:* Very deeply dug and well-manured soil, with adequate drainage and plentiful supplies of moisture.

Outdoor cultivation.—Sow where they are to grow in March or April, 1 in. deep, or in the cold frame in September, January or February. The best thing to do is to open deep trenches early in the winter, so that the subsoil is well weathered. If there is any doubt about the fertility of the soil, add a few handfuls of bonemeal, as it is being turned over.

Cultivation under glass.—When grown under glass the peas can be cultivated in pots, or in trenches of good soil similar to those prepared for outdoor cultivation.

Seeds can be sown in boxes about the last week in September and allowed to germinate in the cold frames in the same way as the open-air plants.

Pot them on as required and by about February they will be ready to plunge in the trenches where they are to flower. Pots should be set so that the rims are about an inch below the level of the trench. If it is preferred, the plants can be taken from the pots and planted direct into the trench itself.

Sweet Peas under glass may need shading from bright sunshine in the case of orange and other bright colours, as these fade easily in the sun and will not be fit for exhibition. The flowers grown under

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

glass should be a few weeks earlier than those outdoors.

Those who grow Sweet Peas for exhibition are recommended to consult the literature of the National Sweet Pea Society, which has done useful work in listing varieties that are too much alike to be exhibited in the same class as separate varieties. The society has also made recommendations of worth-while varieties for ordinary garden decoration, a selection of these varieties being as follows:

"Ambition," rosy lavender; "Chieftain," rich mauve; "Jack Hobbs," flushed pink; "Mayfair," rose-pink; "Olympia," rich purple; "The Admiral," navy blue.

SWEET SULTAN.—*See* CENTAUREA.

SWEET WILLIAM, *Dianthus barbatus* (Caryophyllaceæ).—Biennials easily raised from seed sown outdoors, in ordinary soil. Sow in summer and thin out or transplant as soon as possible. Plant out where they are to flower in autumn 12 in. apart.

SWEET WIVELSFIELD. — A new annual or biennial, raised by crossing Sweet Williams with the Allwoodii pinks. It can be cultivated in the same manner as Sweet William, and will be found particularly useful for bedding schemes as the flowers are larger and showier. It is now obtainable in separate colours.

SYCAMORE, *Acer Pseudo-platanus* (Sapindaceæ).—A very hardy tree, suitable for exposed and windy positions. Valuable as a timber tree, but without any striking beauty of foliage in autumn. It can be planted in ordinary soil and easily increased by seeds. The specimen standing in Studley Park is regarded as one of the finest in Britain. It is 106 ft. in height and 18 ft. in girth.

SYMPHORICARPUS (Caprifoliaceæ).—Deciduous shrubs found mostly in America, where they are referred to as "Snowberry" or "St. Peter's Wort." Though they possess no floral beauty, their pink and white berries, which appear during the winter season, are a very attractive sight. *Soil:* Ordinary, moist, in sun or shade, or even under trees. *Increase:* By cuttings or division.

SYMPHYTUM (Boraginaceæ).—Hardy herbaceous and tuberous-rooted perennials. *Soil:* Ordinary good, with plenty of moisture, in shade. *Increase:* By root division. These plants, commonly known as "Comfrey," are mostly about 4 ft. in height, with flowers of cream, blue or red.

SYMPLOCOS (Symplocaceæ).—Deciduous shrubs. *Soil:* Ordinary loam. *Increase:* By seed, which may take a year to germinate.

SYRINGA.—*See* LILAC. (This name is often wrongly used for the Mock Orange.)

T

TABERNÆMONTANA (Apocynaceæ).—Evergreen flowering shrubs for the stove. *Soil:* A compost of fibrous peat, sandy loam and some charcoal. Pot in February or March and prune back straggling shoots after flowering. Water freely from March to October and syringe frequently. *Increase:* By cuttings in early summer.

TACCA (Taccaceæ). — Tuberous-rooted stove perennials. *Soil:* Sandy loam and peat. Water freely in summer. Summer temperature, 60°-85°; winter, 60°-65°. *Increase:* By division in spring.

TACSONIA (Passifloraceæ).—Evergreen flowering greenhouse climbers. *Soil:* Equal parts of loam, manure, leaf mould and sand. Pot or plant in well-drained pots or tubs in February or March. Prune in February by thinning out old shoots. Water plentifully in summer. Twice-daily syringing is advised, to keep in check mealy-bug and red spider, to which it is subject. Fumigate when necessary. *Increase:* By seeds sown in heat, or by cuttings of young shoots.

TAGETES, French Marigold (Compositæ).—These half-hardy annuals are disliked by some because of the rather offensive smell of the flowers and foliage. They are, however, attractive to look at, with their orange and bronze shades, and are used for borders or pot cultivation. They include single- and double-flowered types. *Soil:* Rich ordinary, in sunny positions.

Increase: Sow in light soil in March or April under glass and plant out in May. Give liquid manure to exhibition plants.

TAMARINDUS (Leguminosæ).—Evergreen flowering tree for the stove. *Soil:* Sandy loam and leaf mould in well-drained pots or tubs. Water and syringe often in summer. *Increase:* By seeds which have been soaked for some hours before being sown in heat in light soil. Also by cuttings in sand in heat.

TAMARIX, Tamarisk (Tamaricaceæ).—Deciduous and evergreen hardy shrubs, valuable for their feathery foliage and plumes of pinkish flowers in summer and autumn. *Soil:* Ordinary or light, sandy loam. Plant in winter or early spring, when they may be pruned into shape. They are particularly successful near the seaside. *Increase:* By cuttings of mature wood in late autumn.

TECOMA, Trumpet Flower (Bignoniaceæ).—Hardy and greenhouse deciduous climbing and flowering shrubs. *Soil:* For indoor plants, a compost of two parts of loam with one of peat and silver sand in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

well-drained pots in sunny greenhouse. Ventilate and water freely in summer. Plant outdoor species in autumn in loam and sand, against a south wall. Prune all by cutting away portion of strong and most of weak shoots in February. *Increase:* By cuttings of shoots in sand in heat or by cuttings of roots in spring.

TECOPHILÆA (Hæmodoraceæ).—Half-hardy bulb. *Soil:* Compost of sandy loam and cow manure. Plant bulbs 3 in. deep and allow 3 in a 5-in. pot. Plunge the pots in ashes until growth commences. After the leaves turn yellow keep the plants dry. *Increase:* By offsets removed when potting.

TELOPEA (Proteaceæ). — Greenhouse flowering shrub. *Soil:* Sandy loam. Water freely in summer, little in winter. *Increase:* By cuttings in sandy soil with mild bottom heat in May.

TERNSTRŒMIA (Ternstrœmiaceæ).—Half-hardy evergreen flowering shrub having highly-glazed dark green leaves. *Soil:* Ordinary. Plant out in autumn or spring in sheltered position. *Increase:* By cuttings in sandy soil with gentle bottom heat.

TESTUDINARIA (Dioscoreaceæ).—Deciduous greenhouse flowering climber. *Soil:* Equal parts of loam, peat and sand. Pot in early spring and water moderately in summer, and keep nearly dry afterwards. *Increase:* By cuttings in sandy loam under glass.

TETRAGONIA (Ficoideæ).—Hardy annuals grown as a substitute for spinach. *Soil:* Ordinary or, better, light, dry, sunny soil. Sow seed in pots at end of March and keep in a warm frame. Prick out singly into pots, and plant out 3 ft. apart at the end of May. Leaves only are cooked.

THALICTRUM, Meadow Rue (Ranunculaceæ).—Hardy herbaceous perennials with finely-cut leaves. *Soil:* Ordinary or moist sandy loam. Plant from October to March and only lift when necessary. *Increase:* By division in spring.

THEOBROMA (Sterculiaceæ).—Greenhouse trees. *Soil:* Equal parts of fibrous loam and sand with plenty of moisture. Water freely and syringe daily in summer. *Increase:* By seed sown in heat in early spring, or by cuttings rooted in sand under a bell glass in heat.

THERMOPSIS (Leguminosæ).—Hardy herbaceous perennials. *Soil:* Ordinary, in sunny borders. Plant in spring. *Increase:* By seeds sown in a frame in spring or in the open in summer; by division, but this is often unsuccessful.

THRIFT, *Armeria* (Plumbaginaceæ).—Hardy perennials that form tufts or little cushions and are largely used as edging or rockery plants. *Soil:* Sandy loam or ordinary. Plant in spring or autumn. *Increase:* By seeds sown in sandy soil or by division when planting.

BEST TO GROW.—*A. alpina*, has pale-pink flowers. 6 in. *A. gigantea*, bears globular, rosy flowers on stiff stems. *A. maritima.* The native species found growing all round the coast; has some very good varieties.

THUYA (Coniferæ).—Handsome, hardy, evergreen trees and shrubs sometimes used for hedge making. *Soil:* Moist, ordinary garden soil or deep loam. Plant in spring or autumn. For a hedge, plant 18 in. apart in soil that has been well dug over, and trim them in September or April. *Increase:* By seed sown in a frame or by cuttings under a bell glass.

BEST TO GROW.—*T. dolabrata.* Which has dark-green leaves marked underneath with white blotches, and its varieties *nana*, dwarf, and *variegata*, with its leaves tipped white. 30-50 ft. *T. occidentalis.* Of which the leaves turn bronzy in winter. *T. plicata* and *T. orientalis* make good hedge shrubs. There are several varieties of each species. *See also* CONIFERS.

THYMUS, Thyme (Labiatæ).—Hardy herbaceous perennials, excellent for covering bare patches on the rockery. *Soil:* Light, rich, ordinary or sandy loam. *Increase:* By seed sown in April and the seedlings thinned out in June. Also by division in spring.

BEST TO GROW.—*T. vulgaris.* Is grown in the kitchen garden for flavouring. *T. herba-barona.* It is a small, prostrate plant with light-purple flowers in summer and leaves scented like caraway seeds. 6 in.

TIARELLA (Saxifragaceæ). — Hardy perennial herb. *Soil:* Ordinary, in shady beds or rockery. Plant in spring. *Increase:* By division of the roots. *T. cordifolia.* Has feathery racemes of white flowers and small, heart-shaped leaves. 6-12 in.

TIGRIDIA (Iridaceæ). — Half-hardy bulbous plants. *Soil:* Equal parts of loam and leaf mould with plenty of sand. Plant bulbs 3 in. deep and 6 in. apart in April. Mulch with manure when the plants are a few inches high and water freely in warm weather. The bulbs may be lifted for storing in October. They may also be grown all through in the greenhouse. *Increase:* By seeds sown in light soil or by offsets.

TILLANDSIA (Bromeliaceæ). — Stove evergreen epiphytal perennials of which the bracts are richly coloured, scarlet or pink. *Soil:* Equal parts of loam, rough peat, leaf mould and silver sand. Pot in spring and water copiously in summer. *Increase:* By offsets or suckers.

TITHONIA (Compositæ).—Tall, sunflower-like plant usually grown as half-hardy annual. *Soil:* Ordinary. *Increase:*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

By seeds sown in sandy soil in greenhouse. Plant out after hardening off in May.

TOBACCO FLOWER.—*See* NICOTIANA.

TOLPIS (Compositæ).—Hardy annuals. *Soil:* Ordinary. Sow seed out of doors where they are to grow. Thin out the seedlings.

TOMATO.—*Indoor:* Sow seed in February 1 in. apart in prepared seed pans. Maintain temperature of 50° to 60°. Water and ventilate carefully. When two leaves appear transplant to small pots with soil similar to that used for seed pans. Later pot on to larger pots with a compost of fibrous loam. Space 18 in. apart on final beds.

Outdoor: Sow in March. Pot on gradually and plant out in May, in well-prepared soil in a sheltered part of the garden. Give liquid manure weekly and pinch out lateral growths. For diseases *see* PESTS AND DISEASES.

TOOLS.—The gardener should buy the best tools he can afford, and see that they are always cleaned of soil and stored under cover after use. A yearly overhaul of all tools during the winter is recommended. The following, arranged in alphabetical order, are those in common use in garden cultivation.

Bulb Planter.—Removes circular plug of soil by means of iron circle fixed to handle. Useful for planting bulbs in grass.

Cloche.—Sheets of glass pegged at the top to form tent-shaped protectors for early crops. Can be unpegged and stored flat.

Cultivator.—Three to five steel prongs fixed to wooden handle. Does for the garden what a plough does for fields. Larger sizes are obtainable mounted on wheels.

Daisy Grubber.—Short-handled two- or three-pronged tool for inserting beneath lawn weeds. If used during wet weather, a slight jerk will uproot the weed.

Dibber.—A pointed piece of wood, sometimes metal capped, used for planting out seedlings. Dibbers made from broken spade handles are very effective. The point should not be too sharp, but slightly rounded.

Edge Trimmer.—Small tool acting on the lawn-mower principle, which can be run along the edge of the lawn, and saves the trouble of clipping the edges after mowing.

Edging Iron.—Used with garden line to straighten lawn edges. Consists of half-moon-shaped metal with lower edge sharpened, attached to wooden handle.

Forks.—Border forks have either four or five square prongs and are of a small, light nature. For ladies, the prongs are sometimes oval, which decreases the weight.

Digging forks are heavier than border forks, and slightly larger, although they have the same number of prongs. A forged fork is always worth the extra money. Potato forks are broader than digging forks, and the prongs are usually flattened. Hand forks are useful for working between rock plants, seedlings, etc. For lasting qualities a forged metal tool is recommended, although for light work a stamped fork will last some time.

Garden Line.—A length of thick string or rope fixed to a metal (or wooden) pin at each end. Can easily be made at home.

Hoe. — Two main types, push-hoe—pushed away from the user along the rows to uproot weeds; draw-hoe—pulled towards the worker. The swan-necked hoe belongs to the latter type and the Dutch hoe to the former. Canterbury hoe, which is three-pronged, and Onion hoe, which is short-handled, are other types.

Hose.—Black, corrugated, rubber type does not kink, but is not so lasting as the canvas-wrapped type. Non-kink hose is also advertised and is the most satisfactory for lengths over 60 ft. For lengths up to 100 ft. a bore ½ in. in diameter is sufficient. Five-eighths is adequate for 200-ft. length, after which length a hole ¾ in. in diameter is necessary. Brass is the most serviceable material for hose fittings, such as spray nozzles. A hose reel, preferably wheeled, will lengthen the life of the hose.

Incinerator.—A galvanized iron, bin-like structure with a central flue. Burns rubbish with little smoke, therefore valuable for town gardens. The residue can be used as a fertilizer.

Labels. — White-painted wooden labels are suitable for temporary subjects. Metal tabs with stamped names are more costly, but are everlasting. Shrubs and trees particularly need permanent labelling to assist pruning.

Lawn Mowers.—Should be bought of reliable makers so that spare parts can be purchased if required. The machine should be fitted with ball bearings, the blade adjustments should be cast to manipulate by hand, handle and grass-box should also be easy of adjustment. The gears should be enclosed and only good-quality oil used. A 14-in. mower is advised for a one-acre lawn. Motor mowers should be selected with due regard to the area put down to lawn.

Rake.—Used to give a fine tilth on seed beds before sowing. Consists of a series of teeth at right angles to an iron bar, which is usually from 6 to 16 in. in length.

Rollers.—A double-cylinder type is useful for most gardens, but for really small gardens the single-cylinder type is satisfactory. They may be obtained in sizes ranging from 14 in. in diameter and width, weighing about 1 cwt., to about 30 in. in width.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Secateurs, or pruners. — Three main types: guillotine, useful for general pruning; parrot beak, can be used in either hand; single-cut type, skilfully used, are less likely to bruise the growing plant than the other types. Lopping shears are really secateurs or pruners on long handles.

Spade. — Straight blade of hammered steel with preferably a flat iron "tread" or transverse bar is the best type. A sharp bar tires the feet when digging. There are various sizes with proportionate weights. A special patent digger for clay soil is on the market; this has a cut-away pointed blade.

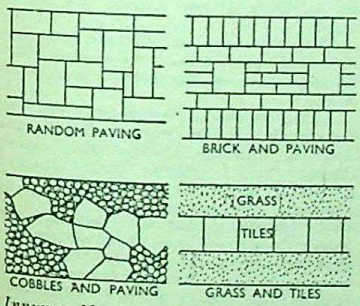
Sprayers.—Varying from hand syringe and bottle sprayer to a knapsack-spraying outfit. The syringe used chiefly for smaller gardens should have more than one nozzle so that they can be interchanged for various purposes.

Trowels vary from 5 to 8 in. in length. As a trowel is a garden necessity it pays to buy a strong one.

Watering Cans.—Greenhouse cans need to be lighter than those for outdoor work. Adjustable roses are necessary for various jobs. Cans last longer if emptied and stood upside down when not in use.

Wheelbarrow.—Ash or elm wood is recommended, as it does not warp. Detachable tops are obtainable. Sizes vary from 30 by 26 in. to 28 by 23 in. A 2-in iron tread to the wheel is an advantage on soft ground. There is now a pneumatic tyre type. Galvanized iron barrows are also obtainable.

TORENIA (Scrophulariaceæ). — Greenhouse annuals. *Soil:* Loam, leaf mould and sand. Train stems to sticks or grow in baskets. Sow in heat in sandy soil and prick out seedlings into flowering position when they are large enough to handle. Pinch back the points of shoots to make bushy growth.



Innumerable ideas will occur to the ingenious gardener for combining bricks, cobbles, grass and tiles for garden paths

BEST TO GROW.—*T. asiatica*, has purple flowers in summer, 1 ft. *T. flava (Baillonii)*, has golden, purple-throated flowers.

TORREYA (Coniferæ). — Hardy evergreen trees allied to the Yew. *Soil:* Good ordinary, in sun or shade. *Increase:* By seed or cuttings.

BEST TO GROW.—*T. californica*, "Californian Nutmeg," 40 ft. Fruits are green, and striped with purple. *T. nucifera*, has a bright-red bark and edible fruits, 80 ft.

TRACHELOSPERMUM (Apocynaceæ). —Evergreen half-hardy climbing shrub. *Soil:* Light, sandy loam. Plant in April or May near a warm wall, and water freely while growing. Prune slightly after flowering. *Increase:* By cuttings under a bell glass in summer.

BEST TO GROW.—*T. divaricatum*, fragrant, yellowish-white flowers in July and August, 15 ft. *T. jasminoides*, with fragrant, white flowers in summer, 15 ft.

TRACHYMENE (Umbelliferæ).—Half-hardy annual for edgings to beds and borders. *Soil:* Ordinary. Sow in mild heat in March, harden off in April, and plant out in May.

BEST TO GROW.—*T. coerulea*, "Blue Lace Flower." Summer, 8 in.

TRADESCANTIA (Commelinaceæ). — Stove and hardy herbaceous perennials. *Soil:* Ordinary for the outdoor plants. Plant in spring or autumn and lift triennially. For stove plants use a compost of equal parts of loam and leaf mould with sand. Pot in March or April. *Increase:* Hardy plants by division, others by cuttings in sandy soil in heat.

BEST TO GROW.—*T. virginiana*, "Spiderwort," which has blue flowers, has several white and blue single- and double-flowered varieties. *T. zebrina pendula* (*Zebrina pendula*) has purple flowers and striped leaves. Often grown as a basket plant.

TRAGOPOGON.—*See* SALSIFY.

TREES.—*See* SHRUBS AND TREES.

TRICUSPIDARIA (Tiliaceæ). — Half-hardy evergreen shrub. *Soil:* Moist, lime-free loam. Plant in September or May near a sheltering wall or near other shrubs or small trees for protection. *Increase:* By cuttings in sandy soil in a close frame.

BEST TO GROW.—*T. dependens*, with white, bell-shaped flowers in August, becomes a small tree, up to 30 ft. *T. lanceolata*, has lovely, crimson, fleshy flowers in May and June, 12 ft.

TRICYRTIS (Liliaceæ). — Hardy and half-hardy bulbs. *Soil:* Peaty loam and sand. Plant 2 in. below the surface in October or March and protect with litter. Indoor plants require a compost of equal parts of loam, peat and sand. Plunge the pots in ashes until growth begins, then water moderately and keep in the light.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Outdoor plants do not flower until the autumn. *Increase:* By offsets removed when potting.

BEST TO GROW.—*T. hirta*, bears white, purple-spotted flowers in autumn, 2-3 ft. *T. macropoda*, has pale purple-spotted with a darker shade flowers, 2-3 ft.

TRIENTALIS (Primulaceæ). — Hardy herbaceous perennials for borders or rock gardens that form small whorls of leaves from which rise slender flower stems. *Soil:* Ordinary. Plant from November to April. *Increase:* By seeds under a hand light in spring, or in the open in summer in light, fine soil. Also by division of the root stocks in spring.

BEST TO GROW.—*T. americana.* "Star-flower." Bears white flowers in May. 6-9 in. *T. europæa.* Wintergreen. Pink and white flowers from April to June. 6-8 in.

TRIFOLIUM (Leguminosæ). — Hardy perennials. *Soil:* Ordinary in sunny borders for the garden species. *Increase:* By seeds or division.

BEST TO GROW.—*T. alpestre* and *T. alpinum*, both with spikes of rosy flowers, may be grown in the rock garden. 6 in. *T. repens.* A creeping species. Has a purple-leaved variety.

TRILLIUM (Liliaceæ).—Hardy tuberous-rooted perennials. *Soil:* Sandy peat or ordinary soil in moist, well-drained, shady borders. Plant in autumn and only lift when necessary. Top dress annually with litter of leaves. *Increase:* By seeds sown on sandy peat in cold frame or by division when planting.

BEST TO GROW. — *T. grandiflorum*, "Wake Robin." White flowers in May. 1 ft., and its rose variety. *T. nivale* has pure white flowers in spring. 6 in.

TROLLIUS (Ranunculaceæ). — Herbaceous perennials with orange and bright yellow flowers; frequently used for planting close to the margins of lakes or in the bog garden. *Soil:* Moist, heavy loam or ordinary. Plant from October to April and lift every three or four years. *Increase:* By seed in a shady position out of doors, and by division.

BEST TO GROW.—*T. asiaticus* bears orange flowers on single-flowered stems in May. 2 ft. *T. europæus* with pale-yellow flowers has both single and double varieties with creamy-white flowers. 2 ft.

TRONCHUDA, Couve (Cruciferæ). — A hardy vegetable that is greatly increasing in popularity. *Soil:* Rich, well-manured soil that has been deeply dug during the winter.

Sow seed outside in March or April. Transplant seedlings when 2 or 3 in. high to 6 in. apart in a separate bed. Plant out in June in final quarters 3 ft. apart. The only attention is frequent hoeing. Gather the outer leaves first and use the fleshy mid-rib.

TROPÆOLUM.—*See* CANARY CREEPER *and* NASTURTIUM.

TULIP (Liliaceæ).—Hardy bulbs classified, owing to their great number, according to form and period of flowering, as Single Early, Double Early, Cottage, Rembrandt, Darwin and Parrot. *Soil:* Light, rich, well-drained land that has been manured at some time previous to planting. Do not use fresh manure. Plant 4 in. deep and 6 in. apart in November or later, but not earlier, as early planting causes the tops to appear above the ground too soon and they are injured by frosts.

Mulch the soil with decayed manure or coconut fibre. Lift the bulbs annually after the leaves have turned brown, dry them thoroughly in the shade, and store them until the following year. If left in the ground they must be protected from frost in winter. Bulbs for indoor decoration are usually grown in bulb fibre. *Increase:* By removing offsets when replanting. If these are very small they may not flower for two years. Also by seeds sown in a frame in light, sandy soil. The seedlings are transplanted the following year and they flower after four or five years.

BEST TO GROW.—The majority of those grown are hybrids derived from one or two species.

Duc van Thol are the first to flower and are obtainable in almost any colour.

Single Early.—"Couleur de Cardinal," red; "Cramoisie Brilliant," bright red; "Mon Tresor," yellow; and "White Swan."

Double Early.—"La Candeur," white; "Tea Rose," yellow; "Imperator rubrorum," scarlet.

Darwin.—"City of Haarlem," scarlet with a blue base; "Glow," brilliant scarlet; "White Queen"; and "La Tulipe Noire."

May Flowering or Cottage.—"Bouton d'Or," bright yellow; "La Merveille," pinkish orange-scarlet; and "Idyll," salmon.

Lily Flowered.—The result of a cross between a tulip species, *retroflexa*, and a Darwin. "Adonis," vivid red; "Mrs. Moon," pale yellow, fragrant; and "Picotee," white edged with pink.

Breeder Tulips are similar in form to the "Darwins," but are predominantly brownish or purplish and have a bloom like that of grapes or plums. "Chestnut," brownish-black; "Prince of Orange," terra-cotta; and "Rio de Siam," deep purple.

Some species of tulips are grown in the rock garden where they prefer sandy loam and may be left for several years.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BEST TO GROW.—*T. Eichleri.* With bright scarlet, yellow-centred flowers. 9-12 in. *T Kaufmanniana.* Petals creamy-white, red on outside with yellow centres. 6 in.

TUNICA (Caryophyllaceæ).—Hardy annual and perennial herbs. *Soil:* Ordinary in crevices of the rock garden or on walls. Plant in October or March. *Increase:* By seed sown in the flowering position or by division.

BEST TO GROW.—*T. Saxifraga.* A dwarf perennial with pale-rose flowers from June to September. 3-6 in. White and double varieties.

U

ULEX.—*See* GORSE.

ULMUS.—*See* ELM.

UMBELLULARIA (Lauraceæ). — An attractive evergreen shrub requiring protection of a wall. The leaves are laurel-like, pleasantly scented when crushed, and the small, yellow flowers are followed by pear-shaped, purplish fruits. *Soil:* Loam, well-drained.

Increase: By seeds sown in sandy soil or by layering in spring.

URCEOLINA (Amaryllidaceæ).—Tender bulbs for the cool greenhouse. *Soil:* Two parts of turfy loam with one of sand and a little bonemeal. Pot in February and water freely when growth begins. Give liquid manure during the flowering period and keep nearly dry in winter. *Increase:* By seeds in sandy loam or by offsets. The seedlings do not flower for three years.

URGINEA (Liliaceæ). — Half-hardy bulb *Soil:* Well-drained, light loam, leaf mould and sand. Pot in October or November. *Increase:* By offsets.

URSINIA (Compositæ). — Half-hardy annuals for sunny beds and borders. *Soil:* Leaf mould, loam and sand or ordinary soil outdoors. Sow seed in February or March and transplant seedlings to 3 in. apart as soon as they are large enough to handle. Pot on into 3-in. and later for flowering 4½-in. pots, or harden off and plant out in May or June.

UTRICULARIA (Lentibulariaceæ).—Insectivorous, aquatic, terrestrial or epiphytal hardy plants. Tiny, pitcher-like appendages to the leaves open and entrap insects. *Soil:* Unnecessary for the aquatics, which float in ponds. Sphagnum and fibrous peat for the terrestrial species. *Increase:* By division.

BEST TO GROW.—*U. vulgaris.* Yellow. Floating.

UVULARIA (Liliaceæ).—Hardy herbaceous bulbous perennials. *Soil:* Moist peat or sandy loam. Plant in autumn. *Increase:* By root division in October.

V

VACCINIUM (Vacciniaceæ). — Hardy evergreen and deciduous flowering and berry-bearing shrubs. *Soil:* Boggy peat, or sandy loam free from lime and with plenty of moisture. Plant from October to March in a shrubbery or rock garden. *Increase:* By seed in sandy peat in heat in spring; by cuttings over bottom heat in summer, or by layering in autumn.

BEST TO GROW — *V. canadense.* A densely-branched shrub with white, pink-tinged flowers in May followed by blue berries. 1 ft. *V. myrtillus.* Bilberry or Whortleberry has pale-pink flowers in May. 6-18 in. *V. pennsylvanicum.* With white, red-shaded flowers in April and May and blue-black berries. Leaves are richly tinted in autumn. Plant in shade. 1-2 ft. *V. vaccillans.* Pink flowers in May and sweet, black berries. 1-3 ft. *V. Vitis-læa.* Has box-like leaves and pinkish flowers. 6 in.

VALERIANA (Valerianaceæ). — Hardy herbs of which few are grown. Do not confuse with the Greek Valerian (Polemonium). *Soil:* Ordinary in a warm sunny position. *Increase:* By seeds outdoors in April or by division in spring.

BEST TO GROW.—*V. officinalis.* With its spikes of white flowers is useful in the wild garden. Widely used as a medicine for the treatment of nervous troubles. Cats like eating the roots and leaves. 3 ft. *V. Phu aurea.* With white flowers is grown for its golden leaves. To develop these, pick off flower buds as they form. 2 ft.

VALLOTA, Scarborough Lily (Amaryllidaceæ). — Evergreen greenhouse bulbs. *Soil:* Equal parts of loam, leaf mould and sand. Re-pot in October, only when necessary, and water freely while the flowers are out; top dress annually. Pot new bulbs in spring. *Increase:* By offsets removed when potting.

VEGETABLE GARDEN.—When a plot is chosen in a new garden for the cultivation of vegetables, it is as well to remember that these succeed best where the soil is open to the sun's rays, that is, not overshadowed by trees or high buildings, but where the winds are not too strong and biting.

A very exposed situation can be adequately screened by erecting a shelter on the north and east sides. If a permanent shelter is not needed, summer protection can be given by the planting of a row or two of Jerusalem Artichokes.

As a rule the vegetable garden is cultivated on conventional lines, the crops being grown in rows parallel with each other, and running north and south, or as nearly as possible in this direction. There are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

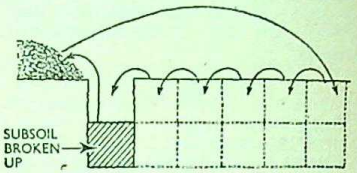
Digitized by Arya Samaj Foundation Chennai and eGangotri

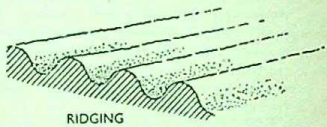
sound reasons for this practice. The crops can be more easily managed, the use of tools such as the hoe is made possible, and the maximum amount of sunshine reaches all parts of the plant and encourages symmetrical growth.

The laying out of the vegetable garden requires considerable thought, as some of the inhabitants will be permanent, while others will be changed from season to season. Asparagus beds are, for instance, a permanent feature, which, when once planted, will remain for a quarter of a century. In making the garden, the first thing is to allot a position to the permanent crops. The next important thing is to mark out the area to be used for other crops, and to make good, serviceable paths sufficient for the wheeling of manure and other necessary work.

After this, the soil should be prepared by deep digging. Generally speaking, the top soil will be found to be darker in colour than the underneath layer, and it is this dark top soil which is most fertile, and which should therefore be kept at the top, where the young plants and seeds are put. It is formed from the break-up of the underlying soil, the decayed remnants of vegetation and the action of earthworms. Whatever method of digging is adopted, the cultivator's efforts should be directed to the breaking up of the infertile sub-soil to a depth of 2 ft. or more, and to reducing the top soil to a fine tilth. Should, by any chance, the dark, fertile soil have been buried under other matter such as clay from house excavations, it must be brought to the surface again during the process of digging. As much as possible of well-decayed manure should be incorporated with the soil. Stable manure, decayed leaves, decomposed weeds, and household refuse are all suitable. After digging, the soil should be dusted with lime, which can be left to wash in with the rains. If the ground for the vegetable plot is prepared early in the winter, it is an advantage to leave the surface rough, as the action of frost will break down the lumps and so create a fine tilth ready for seed growing.

When the actual work of sowing begins, the first tools that are needed are a rake, to prepare the surface, and a line, that is, a length of string, sufficient to reach across the plot, with a stick at each end to hold it taut, which will help to keep the rows straight and parallel. A drill, that is, a long, shallow trench about an inch deep, can then be drawn, using one corner of the rake. A special, triangular hoe, which is sold for the purpose, can be used instead of the rake. Draw the drill alongside the string which is stretched across the plot. The seeds of parsnip, which are usually the first sowings of the year outdoors, can be scattered thinly along the bottom of the drill, by hand. Don't tip them direct from the seed packet, but turn the contents into a cup first, so that you can tell how far they will go. *Move the line before covering the seeds*, measuring the distance at each end with care so that the rows are parallel. Rake the surface to cover the seeds, pressing the soil firm over them. This operation should also obliterate footmarks,





Heavy soils should be dug, preferably by the double-digging system, shown above, and left ridged during the winter for the frost to break up the ground

leaving the plot neat and tidy. Always label each row with the name and variety of the seed sown. When the seeds in the rows show themselves, lose no time, but begin the work of hoeing.

Crops that are hoed regularly will be healthier, and look much cleaner and more attractive than neglected crops. In addition to the rows of crops sown where they are to mature, the vegetable garden should have a small nursery plot in which seedlings of cabbages, cauliflowers, and similar crops, can be raised. These will be transplanted from time to time as the plot is cleared of other crops. With regard to the rotation of crops in the vegetable garden, each cultivator must make out his own scheme, according to special circumstances and his own personal preference.

The general principles that are followed are first to discover the habits of the plants, and the kind of food they need, and then to arrange for plants with different needs to follow each other in the same ground. This avoids the necessity for frequent heavy manuring, and restores a balance to the soil. In a tested, three-year rotation, the crops grown in each of three sections of the plot were as follows:

A. Autumn Cabbage, Brussels Sprouts.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

VEGETABLE SOWING CHART

For Crops Sown and Grown in the Open

Vegetable	*Time to Sow*	*Time to Plant or Transplant*	*Distance for Thinning or Transplanting*	*Distance between the Rows*	*Season of Use*
			ft.	ft.	
Artichoke (Globe)	March-April	April	2-3	3-4	June-Oct.
Asparagus	April	March-April	1½	2-ft.: beds 3-ft. wide	June after 2nd year
Bean (Broad)	Nov.-March	April	½	2-3-ft. between double rows	June-Aug.
,, (Dwarf French)	Late April	—	½	1-2	July
,, (Runner)	May-June	—	½	5-8	July-Oct.
,, (Climbing French)	April-June	—	1	4-5	All the year round
Beet	April-July	—	½	1-1½	July-March
Broccoli (Autumn)	March-April	May-June	2½	2½	Sept.-Feb.
,, (Spring sprouting)	April-May	June-July	2½	2½	March-June
,, (Sprouting)	March-May	May-July	2½	2½	Nov.-April
Brussels Sprouts	March-April	May-June	2½	2-3	Nov.-April
Cabbage (Spring sown)	March-May	May-July	1-2	1½-2	July-Nov.
,, (Autumn sown)	Early Aug.	September	1-2	1½-2	Dec.-March
Cardoon	April-May	—	1½	3-4	October onwards
Carrot	March-Aug.	—	1	1	June: Store in Oct.
Cauliflower (Spring sown)	April-May	April-July	1½-2	2-2½	May-Nov.
,, (Autumn sown)	Sept.-Oct.	Feb.-March	1½	1½	
Celery	April	May-June	½	2-3	Sept.-Feb.
Chicory	May-June	—	½	1	Oct.-May
Corn Salad	Feb.-Oct.	—	½	½	June onwards
Cress	March-Sept.	—	Thickly in boxes or in the open ground.	—	All the year round
Cucumber (Ridge)	May	May-June	2½	4	Aug.-Sept.
Endive	April-Aug.	—	1-1½	1-1½	June-Sept.
Kale *or* Borecole	March-May	June-July	2	2-3	Nov.-March
Kohl Rabi	March-Aug.	—	2	2-3	July-March
Leek	Feb.-March	April-July	1	1½	Nov.-March
Lettuce	March-Sept.	—		1	May-Oct.
Maize	April-May	May	2	2	July-Sept.
Onion	March-Aug.	Feb.-March	½	1	All the year round
Parsley	March-July	—	1	1	All the year round
Parsnip	Feb.-March	—	1	1½	Nov.-March
Pea	Feb.-June	—	½	2-6 According to height	June-Sept.
Potato	Jan.-April	—	1-1½	1½-3	All the year round
Radish	Jan.-Sept.	—	—	—	All the year round
,, (Winter)	October	—	½	1	Nov.-March
Salsify	March-May	—	½-1	1½	Oct.-March
Savoy Cabbage	March-May	May-July	1-2	1-2	Aug.-March
Scorzonera	March-May	—	1	1½	Sept.-March
Sea Kale	March-April	March	1½-2	2½	Nov. onwards
Shallot	March	Jan.-Feb	½	1	July-March
Spinach (Summer)	Feb.-May	—	1	1-1½	May-Sept.
,, (Winter)	July-Sept.	—	½	1-1½	Oct.-Jan.
Swede, Garden	April-July	—	½	1½	Oct.-March
Turnip	April-Aug.	—	1	1½	Aug.-Spring
Vegetable Marrow	May	May-June	2	4-5	July-Nov.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Broccoli, Autumn Cauliflower, Kidney Beans, Peas.

B. Broad Beans, Celery, Lettuce, Parsnips, Turnips, Beet, Carrots, Onions, Shallots.

C. Potatoes and Runner Beans with a few odd salads.

The A group was grown on the soil vacated by the B group, B on the soil vacated by C, and so on in succeeding seasons.

Further details concerning the cultivation of the main vegetable crops will be found under each vegetable—beans, peas, etc. A table showing the times, and other particulars of seed sowing, is given on page 465 for handy reference.

VEGETABLE MARROW, *Cucurbita Pepo ovifera.*—A half-hardy annual vegetable. *Soil:* Rich, well-drained, in a sunny position. The ground should be well manured some time before planting. Sow seed in heat in April in pots of turfy loam. Harden off and plant out seedlings in May. For a later crop sow seed in May in a permanent position. Protect the seedlings at night for two or three weeks after planting, with inverted flower pots or litter.

Seedlings should be planted out on a refuse heap consisting of leaves, sweepings and decayed vegetable matter. If the fruit does not set, plenty of water should be given. Feed liberally with liquid manure or soot water while growing.

VARIETIES.—"Custard," "Long White," "Moore's Cream."

VENIDIUM (Compositæ).—Half-hardy annuals and perennials that are all grown as annuals. *Soil:* Ordinary. Sow seed in light soil in warmth in March or April and plant out seedlings in May or June.

BEST TO GROW.—*V. calendulaceum*, produces yellow and brownish flowers all the summer, 2 ft. *V. fastuosum*, has larger flowers with a black centre, 2 ft.

VERATRUM (Liliaceæ).—Hardy herbaceous perennials. *Soil:* Ordinary or rich, in moist, partly shaded borders. *Increase:* By seed sown in summer or by division.

BEST TO GROW.—*V. album*, with white flowers in July, 3 ft. *V. nigrum*, has blackish, maroon flowers and long, narrow leaves, 4 ft All have poisonous roots and must not be left where animals or children can touch them.

VERBASCUM (Scrophulariaceæ). — Hardy biennials and perennials largely used for borders or the wild garden. *Soil:* Ordinary light, rich. *Increase:* By seeds sown out of doors in April, the seedlings being transplanted when three or four leaves have formed and planted in flowering position the following April. The perennials increase by division in spring.

BEST TO GROW.—*V. olympicum*, of stately habit, covered in yellow flowers in summer, 6 ft. biennal. *V. Thapsus*, "Aaron's Rod," with yellow flowers, 6 ft. *V. Chaixii*, a perennial with branching spikes of yellow flowers, 1-3 ft. Good hybrids are "Cotswold Queen," "Miss Wilmott" and "Gainsborough."

VERBENA (Verbenaceæ).—Half-hardy annuals and perennials from which have been derived many fine hybrids, for bedding. *Soil:* For pot plants use sandy loam and leaf mould with a little manure. Pot up in February or March and water freely during the growing period. Nip off the points of shoots to induce bushy growth. Plant out of doors in ordinary soil in sunny beds or borders. *Increase:* By seeds sown in a warm frame and hardened off for planting out in May; by cuttings taken in August and struck in sandy soil in a cold frame and kept in boxes in the greenhouse until March, when they are potted singly; also by young shoots taken off plants in February that have been wintered in the greenhouse. Grown as half-hardy annuals, troublesome pests and diseases are avoided.

BEST TO GROW.—*V. aubletia*, has loose heads of rosy flowers. Rose Vervain, 1 ft. *V. chamaedrifolia*, with creeping stems ending in scarlet flowers from June to September, 6 in. *V. venosa*, with lilac or bluish flowers, is a good border plant, 6-12 in.

VERBENA (Lemon Scented). — *See* LIPPA.

VERONICA, Speedwell (Schrophulariaceæ).—Hardy evergreen flowering shrubs and herbaceous perennials. *Soil:* Well-drained ordinary or loamy peat, in a sunny position.

Plant in September or April and protect in severe weather. Pruning consists in cutting hard back every few years and into shape annually. The hardy perennials thrive in any soil in borders or on rockeries. *Increase:* By cuttings in sandy soil in a close frame; by seeds sown in light soil out of doors in April, and the perennials by division.

BEST TO GROW.—*V. Andersonii*, flowers blue, ageing to white, and its variegated form, 2-3 ft. *V. Balfouriana*, dark-blue flowers and deep-green leaves, 6 in. *V. cupressoides*, with pale blue flowers resemble a dwarf cypress, 1-3 ft. *V. gentianoides*, forms mats of dark-green foliage along the stems of which are set greyish flowers, up to 2 ft. *V. Hulkeana*, bears panicles of pale-blue flowers. One of the best but rather tender, and needs wall protection, up to 12 ft.

VIBURNUM (Caprifoliaceæ).—Deciduous and evergreen hardy flowering shrubs

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Soil: Deep, moist loam. Plant the deciduous shrubs in October or March and the evergreens in May or September. Trim into shape and thin out old wood in winter. *Increase:* By cuttings in sandy loam with bottom heat in July and August or by layering in October.

BEST TO GROW.—*Evergreen species: V. cylindricum*, white flowers tinged pink, freely produced in May and waxy leaves. Becomes a small tree with black berries, up to 40 ft. *V. japonicum*, has dark, glossy-green leaves and scented white flowers, 6-8 ft. *V. Tinus*, "Laurustinus," a popular evergreen with rosy buds and flowers ageing to white, has several attractive varieties, 10 ft.

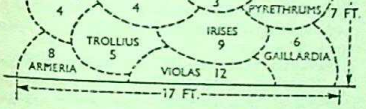
Deciduous species: V. Carlesii, has large sweetly-scented, pinkish-white corymbs of flowers. Excellent at the seaside, 3-4 ft. *V. fragrans*, a lovely shrub bearing blush-pink flowers in winter and early spring, followed by red berries, 10 ft. *V. Opulus*, a native species laden with bright-red berries and crimson leaves in autumn, 10-15 ft. Its variety *sterile* is the popular "Guelder Rose."

VICIA.—*See* BEANS, BROAD.

VINCA.—*See* PERIWINKLE.

VINE.—*See* VITIS.

VIOLA, Violet, Pansy (Violaceæ).—Hardy perennial herbs used for borders or rockeries. Pansies are any free-flowering, free-growing strain with a "pansy" face,



PERENNIAL PLANTING PLAN

Allow about five herbaceous plants to every square yard of border. This gives a bold effect during the first year after planting

either self coloured or variegated. Show pansies have round blooms with thick, velvety petals with a dark blotch in centre with an orange eye. Fancy pansies differ in having crinkly or wavy edges. The tufted pansies, known as violas, are hybrids between *V. cornuta* and the pansy and are of compact dwarf habit. *Soil:* Deep, rich, moist loam. For exhibition plants dig over the soil in autumn and incorporate old manure or bonemeal. The ground is left rough until spring when an artificial manure is used. Plant in March or April, 10 in. apart, or in September, 12 in. apart. Exhibition plants are staked to prevent damage by winds, and the growths to each plant restricted to 2 or 3. Water frequently in dry weather and give doses of liquid manure every ten days or so.

Violettas are the result of a cross between a pansy, "Blue King," and *V. cornuta*. The flowers are oval, rayless and pleasantly scented, and the plants of a dwarf, bushy habit.

They like an open, rich soil and are excellent on the rockery.

Bedding Violas.—These should be of dwarf habit with stiff, erect stems, and usually have numerous flowers. The soil may be rich loam but in conjunction with other plants in beds and borders they will be found to grow in any soil.

VIOLET.—*V. odorata* has many hardy varieties used for borders and beds in shade. *Soil:* Enriched, moist, ordinary with plenty of lime. Plant in April and apply liquid manure in summer. *Increase:* By seeds in a fine mixture of good loam, leaf mould and sand in boxes which are shaded until the seedlings appear above the soil.

If a cold frame or greenhouse is not available, seeds may be sown out of doors in a cool, shady border in fine, deeply-dug soil. Thin out and in October transplant to their permanent position.

Exhibition and named plants are increased by cuttings of basal shoots inserted in sandy soil in July or August. Violetta cuttings should be rooted in frames. Species mostly used for the rock garden are increased by seed or cuttings. Violet seeds are very uncertain and often take a year or two to germinate. The underground stems have rooting stolons which soon increase the stock. "Parma" violets rarely produce seed and must be increased by runners.

BEST TO GROW. — Bedding Violas. "Apricot," "Pickering Blue," "Kitty Bell," "Swan," and "Sweet Lavender."

Show Violas. — "Helen Cochrane," white; "Edith Bastock," white shading to purple; "Rena Loan," deep yellow; and "Chriss Littlejohn," a fancy.

VIOLETTAS.—"Queen of the Year," blue touched with white, and "Gold Crest."

Rock Garden Species.—V. cornuta, a richly coloured purple, is one of the parents of many of the garden forms. Summer, 6 in. *V. gracilis*, a deep purple, has produced many breaks such as "Lady Jenkinson," pale blue and white, and "Royalty," a very deep blue. 4-6 in.

VIOLETS.—Good varieties of violets are "Princess Mary," pink streaked violet-blue flowers, and "Princess of Wales."

Parma varieties are "Marie Louise" and the "Comte de Brazza"; white flowers.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

VIOLA PESTS AND DISEASES.—Slugs are sometimes found to be troublesome in the spring but they can be kept off by dusting the ground with soot. If it is found that the stems wither and rot all the plants must be burned.

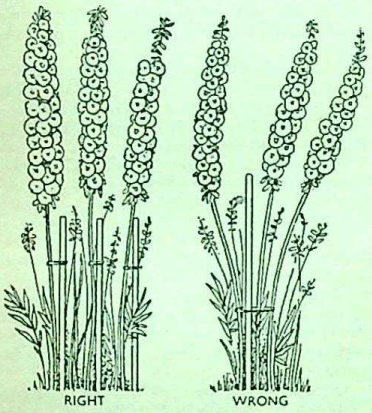
VIOLET.—*See* VIOLA.

VISCARIA, *Lychnis* (Caryophyllaceæ).—Hardy annuals now allied with Lychnis. *Soil:* Ordinary. Sow in April where they are to flower and for pots sow in autumn and winter in the greenhouse.

VISCUM.—Mistletoe (Loranthaceæ).

VITIS (Vitaceæ).—Hardy and half-hardy shrubs and climbers including Ampelopsis and Parthenocissus. *Soil:* Good ordinary for outdoor species. Plant in autumn and prune straggling shoots in late winter or February.

CULTURE OF THE GRAPE VINE.—*Soil:* Prepare a bed several feet wide in a warm house, by digging out the soil to a depth of 3–4 ft. Fill in with a 6-in. layer of clinker or broken brickbats, then fill in



ONE STAKE TO EVERY BLOOM

STAKING PERENNIALS

Stately perennials need an individual stake to each bloom. Smaller plants can have separate ties to one stake, which should be placed towards the back of the clump

with turfy maiden loam, a little lime, charcoal and wood ashes. Plant in October 5 ft. apart. Start growth at a temperature of 40°-45° and increase gradually until in the flowering season it reaches 60°. Ventilate as freely as is consistent with maintaining an even temperature. Water only when necessary.

Prune by cutting back young vines to 5 ft. Tie in side shoots horizontally and allow one alternately on either side of the main rod 1 ft. apart. Allow no fruit to set for the first three years. On an older vine prune when leaves have dropped by cutting all shoots to within two buds, bend over the rod and tie it close to the ground.

When disbudding thin out both bunches (allowing one to a foot of rod) and individual grapes on the bunches. Take off surplus branches once the fruits have set. *Increase:* Grapes by seeds sown in sandy soil in heat; by "eyes" in spring, by layering or by cuttings, by grafting when in flower. The hardy species by cuttings in sand.

BEST TO GROW.—*V. vinifera*, parent of the many varieties of cultivated grapes of which the best indoor variety is "Black Hamburg." "Bucklands Sweetwater" may be grown out of doors against a warm south wall. Hardy ornamental species is *V. Coignetiæ*, of which the huge leaves assume brilliant rich tints in autumn. It climbs anywhere.

VRIESIA (Bromeliaceæ). — Epiphytal perennials requiring stove treatment and bearing red and purple flowers in early spring and late summer. *Soil:* Equal parts of loam, peat, leaf mould and silver sand. Pot in early spring and water copiously in summer. Syringe daily from April to September and shade from hot sun. *Increase:* By offsets in sandy soil in spring.

W

WAHLENBERGIA (Campanulaceæ).—Dwarf hardy perennials, for moist, sunny rockeries. *Soil:* Gritty soil with leaf mould. Plant from October to March. *Increase:* By seeds sown in warmth in spring or by cuttings in summer.

BEST TO GROW.—*W. hederacea*, Creeping Harebell, with trailing blue flowers in summer. *W. serpyllifolia*, bears large purple flowers on prostrate tufts of leaves, 3 in. Some species are synonymous with Edrianthus.

WALNUT, *Juglans regia* (Juglandaceæ).—Hardy deciduous tree, well known for its familiar fruits and much used for providing shade. *Soil:* Provided it is well drained it is not particular as to soil, but should be in a warm position. Plant in October. Nuts for pickling should be picked before the shells are quite hard. Useful for a town garden, and the wood is valuable for timber.

Dessert nuts are best stored in sand until needed. *Increase:* By seed (nuts) sown outdoors in November in light soil, by budding in summer or by grafting in spring.

WATER PLANTS.—Water plants may be roughly divided into three groups —

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

aerating or oxygenating plants, decorative plants, and marginal plants.

The first group, oxygenating plants, must be grown in all ponds where fish are kept. Fish take oxygen from the water, and return carbon dioxide. This will, if absorbed into the water, cause it to become grey and smell unpleasant. Plants, in the presence of sunlight, absorb the carbon dioxide, and thus restore the balance.

The chief plants recommended for cultivation where fish are kept are as follows: Shallow ponds: *Fontinalis antipyretica*, *Callitriche obtusangula*, Ranunculus, Myriophyllum.

Medium ponds: *Elodea canadensis*, *E. crispa*, *E. densa*, Potomageton, Ceratophyllum.

Among the decorative plants, the best known are the Nymphæas or Waterlilies. These need water of about 2 ft. in depth, except in some of the pigmy species which will grow in 12-18 in. Nelembiums, Nuphars, Brasenia and Sagittarias are also suitable for growing in ponds for decoration.

The easiest way to cultivate waterlilies is to plant them in the mud of a natural pond or stream. This is done by merely enclosing the roots, with a little suitable soil, in a loosely woven basket, and dropping it into the bottom of the water. Or the roots can be tied between two turves and lowered in the same way. If the pond is artificial, soil must be put over the bottom to a depth of about 6 in. Six feet should be allowed between each plant in the case of larger nymphæas, but the pigmy types can be as close together as 2 ft.

Heavy loam enriched with cow manure, or if this is unobtainable with bonemeal, is the best for waterlilies.

Plant them in May or before the last week in June.

The planting of other water plants can be carried out in much the same way. If a new pond is being planted, it is generally best to plant before the pond is filled, covering the newly set roots with a few inches of water only, and adding more as growth proceeds.

If aquatic plants are grown in the greenhouse in a warm tank, similar procedure is adopted.

It will pay the amateur to make full inquiries from the firm that supplies the plants (and fish, if fish are to be kept), as this subject is a large one which cannot properly be dealt with in a small space.

Waterlilies are obtainable in many hundreds of modern varieties, of which the following is a useful selection, covering a wide colour range.

Nymphæa alba, white; *N. Marliaca rosea*, flesh, fragrant; *N. Moorei*, canary yellow; *N.* "Paul Herriot," salmon red; *N. pygmæa alba*, dwarf white, suitable for tubs; *N. p. helvola*, dwarf yellow, suitable for tubs; *N.* "Wm. Falconer," bright crimson; *N. cærulea*, blue, for greenhouse tanks; *N.* "Mrs. Whitaker," blue, for greenhouse tanks.

Nuphars are waterlilies of easy culture, in fact they can be grown simply by throwing seed into the water. *Nuphar luteum*, the yellow British Waterlily, is a commercial variety.

Nelembiums are suitable for the greenhouse tanks, and are obtainable in pink and white colours. These are called Water Beans.

In addition, there are some floating plants that may be classed with the decorative aquatics. Of these the best known are *Azolla caroliniana*, *Hydrocharis morsus ranæ*, *Lemna*, *Stratiotes aloides*, and *Trapa natans*.

The marginal plants are for the most part described elsewhere.

Some of the best for the sides of small ornamental ponds are Acorus, Alisma, Butomus, Caltha, Iris, Juncus, Mimulus, and *Myosotis palustris*.

A small point, but one worth noting, is that plants set along the sides of streams will look more natural if, in addition to a bold group here and there, odd plants are allowed to appear farther down the stream. The finished effect is then as if the plant seeds had been carried and spread by the action of the stream.

WEEDS, OBNOXIOUS.—Weeds are plants that are growing out of place, not necessarily ugly but usually harmful because they are of hardy, vigorous growth, and increase so rapidly that they crowd out the more lawful or as one might say, the more delicately nurtured denizens of the garden.

Gardeners are required by law to clear their ground of weeds, not for their own benefit but for their neighbours! In clearing out weeds the soil is aerated by using the hoe, and annual weeds may be turned over to make green manure.

Bracken, Bindweed, Deadly Nightshade, Charlock, Coltsfoot, Dandelion, Clover, Plantain, Dock, Nettle, Thistle and Groundsel are amongst the most troublesome of weeds. Handpulling and hoeing will eradicate them or prevent them from spreading. Lawn sand kills weeds on lawns, and there are many proprietary preparations that are effective.

WIGANDIA (Hydrophyllaceæ).—Stove ornamental foliage plants. The leaves are very large and wrinkled, sometimes covered with down. *Soil:* Ordinary. Best raised as annuals, seed being sown in heat in February. Harden off before planting out

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in sunny beds in May. Lift in September. May be increased by cuttings in sandy soil.

WILD ROSEMARY.—*See* ANDROMEDA.

WILLOW.—*See* SALIX.

WINDFLOWER.—*See* ANEMONE.

WISTARIA (Leguminosæ).—Hardy deciduous flowering and climbing shrubs. *Soil:* Rich, sandy loam or ordinary. Plant in March or April and prune in January or February. *Increase:* By layering in summer.

BEST TO GROW.—*W. floribunda.* Purplish-blue flowers in racemes and its white variety. *W. sinensis.* Is the most popular of the Wistarias. It bears fragrant lilac flowers in long racemes in May, and sometimes again in August. By hard pruning it may be grown as a standard.

X

XANTHISMA (Compositæ). — Hardy annual with yellow flowers. *Soil:* Ordinary garden soil. *Increase:* By seeds sown in the open in spring.

BEST TO GROW.—*X. texanum.* Flowers 2-3 ft. high.

XERANTHEMUM (Compositæ).—This genus is now classified with Helichrysum by botanists. It is a pretty, everlasting flower in many colours and is found in single and double forms. *Soil:* Ordinary garden soil. *Increase:* By seeds sown in March in boxes under glass for transplanting, or sown in the open in early spring. *See* EVERLASTING FLOWERS.

Y

YEW.—*See* CONIFERS.

YUCCA, Adam's Needle (Liliaceæ).—Handsome foliage plants from N. and C. America. The leaves are sharply pointed and the flowers creamy-white of drooping habit. They are excellent for the purpose of imparting a sub-tropical atmosphere to a garden. *Soil:* Light, loamy soil in sunny position. *Increase:* By cutting off the roots inserted in a frame, or by suckers. Avoid stiff, wet soil in the pots. The Yuccas do not flower while young, but *filamentosa* (one of the species) is an exception.

BEST TO GROW. — *Y. angustifolia.* Greenish-white flowers on spikes 3-4 ft. high, during July. *Y. filamentosa.* As stated, this flowers when young during July. The flowers are creamy-white and borne on spikes 3-6 ft. Leaves 2½ ft. long and 2 in. across.

Z

ZAUSCHNERIA, Californian Fuchsia (Onagraceæ).—Half-hardy shrub growing about 1 ft. high, with brilliant red flowers in summer. *Soil:* Light loamy soil in sunny position, on a rockery or in pots in a frame. *Increase:* By seeds or by cuttings from the young shoots which push up round the main plant.

ZENOBIA (Ericaceæ).—The species *Z. speciosa* is a hardy shrub, with white flowers that bloom in summer. *Soil:* A peaty soil with a mixture of leaf mould. Plant in semi-shady position. *Increase:* By sowing seeds in the spring or by layers. Also by cuttings of half-ripened shoots taken in early summer and placed in bottom heat.

ZEPHYRANTHES (Amaryllidaceæ).—A small genus of bulbs. *Soil:* Two parts loam, one part each leaf mould and sand. Water freely during growing period. Good drainage essential. After flowering the plants should be allowed to dry off gradually. *Increase:* By offsets when repotting, or by seeds, if obtainable.

BEST TO GROW. — *Z. atamasco.* The most popular. Flowers pale pink in spring. Height 15 in. *Z. Andersoni.* The Peruvian Swamp Lily. Yellow flowers in spring. Height 6-9 in. Greenhouse culture is necessary for this species.

ZINGIBER (Zingiberaceæ).—Tuberous-rooted perennial, requiring stove culture. *Soil:* Rich, loamy soil with a little peat and sand. *Increase:* By division in February or early March.

BEST TO GROW.—*Z. officinale.* Purple-blue flowers with decidedly yellow lip, in July. Provides the ginger of commerce. *Z. Cassumunar.* Bengal Root. Flowers pale yellow with red bracts, in July. Height ranges to 5 ft. and over.

ZINNIA (Compositæ).—Attractive and decorative half-hardy annuals, very suitable for mixed borders or bedding purposes. Remarkable for the profusion and duration of their flowers. Lovely for cut blooms. *Soil:* Dislike damp in the seedling stages and care should be taken in watering. Plant in well-drained soil in a warm, sunny place.

Increase: By seeds during March in cold frames, pricking off the seedlings when large enough, and hardening them off and planting out during first week in June. The seeds may also be sown in the open border during the first week of May, and treated as hardy annuals.

BEST TO GROW.—"Buttercup," immense deep creamy flowers, half-hardy, similar to Dahlias. "Exquisite," light rose with deep rose centre, half-hardy, closely resembles Dahlias. "Achievement," very distinctive. The petals are partially tubular at the base and in cactus-like form towards the tip.

ZYGOPETALUM.—*See* ORCHIDS

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RADIO AND TELEVISION GUIDE

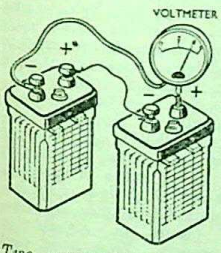
Complete outline in simple language of the Theory and Practice of wireless and its various modern applications

ACCUMULATOR.—There are two types of accumulator in general use, the one uses nickel and iron plates and an alkaline solution, and the other lead plates and an acid solution. The latter is the type most frequently employed in connection with battery-actuated radio receivers. The accumulator supplies the current for heating the filaments of the valves. For this purpose, two volts of electrical pressure normally suffice and, therefore, only the one accumulator cell is needed.

For higher voltages, two or more cells can be connected in series: that is, the positive terminal of one cell being joined to the negative of the next cell and so on, as in a car battery.

The action of an accumulator is electro-chemical. When a current of electricity is passed through it during the charging process, a chemical change takes place at the conclusion of which the accumulator is said to be charged. It is then capable of supplying an electrical current and, while it does this, a reverse chemical action takes place. Looked at in another way, the charging current stores up energy in the accumulator in a chemical form. Then, by means of a chemical action, the accumulator produces an electric current when required merely by connecting up.

The condition of an accumulator can to some extent be gauged with a voltmeter. The voltage of each cell should be about 2.2 at the completion of charging. It then fairly quickly drops during the first period of use until it reaches about 2.1 volts, then more gradually to 2 volts, at which value it remains fairly constant until it approaches the point of exhaustion and recharging becomes essential. The voltage of an accumulator cell should never be allowed to fall below 1.8 volts or a harmful sulphation of its plates may occur.



Two accumulator cells joined in series provide twice the voltage of one (amperage is unaltered)

Charging and discharging affect the specific gravity of the acid solution, and testing the acid with an acid tester is a reliable guide to the state of charge, so long as the acid solution was of the correct specific gravity in the first instance. The specific gravity ought to be around 1.215 in the fully charged condition and 1.150 when the fully discharged condition is reached.

The ampere-hour capacity of an accumulator is a measure of its ability to supply current based upon given rates of discharge. If the capacity is twenty ampere hours, it means that the accumulator should be able to supply, for example, one ampere of current for twenty hours, or two amperes for ten hours before recharging becomes necessary, if these currents are within the limits of the discharge rate specified.

There is a practical limit to the current that ought to be demanded of any accumulator beyond which serious damage to it might result. For example, large, heavy ones are needed as car starter batteries as against those employed for battery radio sets which demand much less current.

Accumulators must be regularly charged. If they are to stand idle for long periods, they should be fully charged, the acid solution poured out and the interior given several rinsings with distilled water.

The terminals should at all times be kept clean and coated with petroleum jelly to prevent corrosion. Evaporation of the acid solution should be made good with distilled water. If any acid solution is spilt it should at once be neutralized with soda, or floors, carpets, etc., may be severely damaged. It is advisable to stand an accumulator on a glass, earthenware or lead tray so that any acid creeping down the outside of its casing can do no harm.

When mixing an acid solution, always add acid to water and never water to acid. *See* BATTERY CHARGING, SULPHATION.

ADAPTER.—Various kinds of adapter have been used in connection with radio receivers. Radio servicemen use an adapter which, by being interposed between a valve and its holder, enables external connections to testing instruments quickly to be made. Then there is the short-wave

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

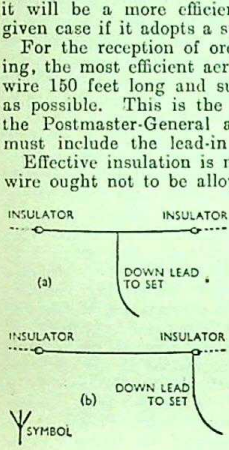
Digitized by Arya Samaj Foundation Chennai and eGangotri

adapter by which the wave ranges of a receiver, normally able to receive only the medium and long waves, can be extended to the short waves. It should be noted that any particular short-wave adapter may not necessarily be suitable for all types of radio receiver.

AERIAL.—The arrangement by means of which electro-magnetic waves are radiated from a transmitting station and which enables these waves to induce electric currents at a receiving station. Any piece of metal, whether in the form of wire or not, will act as a receiving aerial, though it will be a more efficient collector in a given case if it adopts a special form.

For the reception of ordinary broadcasting, the most efficient aerial is a length of wire 150 feet long and suspended as high as possible. This is the limit allowed by the Postmaster-General and the 150 feet must include the lead-in to the receiver.

Effective insulation is necessary and the wire ought not to be allowed to come into direct contact with walls, trees or other objects. If an outdoor aerial cannot be arranged, the next best is an aerial in the roof space. An aerial comprising some insulated wire running round a picture rail may often prove adequate.



Two kinds of aerial arrangement which are suitable for normal reception

At close ranges, television can be received on such aerials as have been mentioned, but usually a special type is essential. It is what is known as a dipole, and comprises an arrangement that has to be fixed at the highest available point, such as on top of the roof.

Loop aerials are not efficient collectors, especially of medium and long waves, but their compactness makes them suitable for portable receivers, and their directional characteristics were, before the development of radar, the basis of all direction-finding systems. The best reception on a loop aerial is obtained when it is in line with the direction of the transmitter, and the position of minimum reception is when it is at right angles to that direction.

Owing to the increased sensitivity of modern radio receivers, there is a tendency for listeners to attach little importance to aerials. It is as well to remember, however, that if there is an efficient aerial there will be reserves of reception power to offset the inevitable depreciation in the efficiency of the valves and other components.

ALL-MAINS RECEIVER.—A radio receiver employing valves which derives from the power mains all the current needed for its operation. The normal all-mains receiver, or mains set, as it is more usually called, takes less current from the mains than a small electric-light bulb, so that it can safely be connected to a light point. Nevertheless, its connecting cable, plug, etc., should be treated with as much care and respect as those of any other electric devices joined to the mains. The set should be totally disconnected from the mains before exposing any interior part in order to replace valves or make any other adjustment. *See* HUM, MAINS, MAINS AERIAL.

ALL-WAVE RECEIVER.—The description often applied to a radio receiver able to receive programmes from short-wave as well as medium- and long-wave broadcasting stations.

ALTERNATING CURRENT.—This is an electric current which alternates in its direction of flow like a clock pendulum alternating in its direction of movement. Direct current flows in the one direction all the time. The electric current from a torch battery or any other battery is direct current and it always flows out of the one terminal through the external circuit and back to the other terminal; the flow can never be in the reverse direction.

When a direct current is switched on, as when, for example, the switch of a torch is operated, it does not instantaneously assume its full value. An appreciable though extremely small space of time elapses before the current rises to its full value. The minute delay is caused by what is known as the inductance of the circuit. But having reached its full value as determined by the pressure and the resistance in the circuit, it keeps that value steadily.

An alternating current, on the other hand, rises and falls in both voltage and current. The voltage at the source rises and falls and the current in the circuit therefore rises and falls. From zero it rises to a maximum in the one direction of flow, falls again to zero, then rises to a maximum in the other direction of flow and then falls again to zero. That is one complete cycle; a complete rise and fall of value in each direction. The number of times it does this in each second of time is its frequency. The standard frequency for alternating current mains in Britain is fifty cycles per second. That is to say, during the space of time of one second, the current rises to maximum and falls to zero in each direction fifty times.

This fluctuation has little practical effect

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on electric lights and radiators as it is so rapid, though sometimes it is evinced by a humming from a radiator.

When the voltage and current have their maximum and zero values at the same time they are said to be in phase. But it is possible for the current values to occur before the corresponding voltage values and then the current is said to be leading; if they occur after, the current is said to be lagging. It will now be understood what is implied by the words "out of phase." It should be noted that we have been discussing the phase relationships which may exist between an alternating electrical pressure and the alternating current which that pressure causes to flow in a circuit.

In a three-phase mains supply there are three electrical pressures (voltages) each setting up corresponding electrical currents which reach their maximum and zero values in turn. Power stations almost invariably send out a three-phase supply, generally through a three-wire system, and most factories will be served with all three phases. But an ordinary domestic supply of alternating current is always a single phase served through one pair of wires.

AMMETER. — An instrument for measuring the rate of current flow in a circuit. Direct readings are given in amperes. An ammeter is connected in series so that it forms a link in the circuit. For this reason, it is necessary for an ammeter to have a low resistance. A moving-coil type of ammeter will not respond to alternating currents, whereas a moving-iron type will respond to both direct and alternating currents.

AMPERE. — The practical unit of electric current. It corresponds to gallons per minute as applied to water. When a quantity of electricity equal to one coulomb (a coulomb is the unit of quantity) has flowed for one second, that is an ampere. Five amperes is the flow of five coulombs in the space of one second, ten amperes the flow of ten coulombs in one second, and so on.

AMPERE-HOUR CAPACITY. — The capacity of an accumulator measured in ampere hours. An accumulator having a capacity of forty ampere hours is, after being charged, theoretically capable of giving a current of one ampere for forty hours, two amperes for twenty hours, half an ampere for eighty hours, and so on. In practice, however, a more or less precise ampere-hour capacity rating can be applied only in connection with a given current. An accumulator's ampere-hour capacity tends to vary as with the current that is taken from it, and will be smaller for higher currents.

AMPLIFICATION FACTOR. — This gives an indication of the amplification effectiveness of a valve. It is the number of volts by which the potential of the anode must be changed to counteract the effect on the anode current of a change in the grid potential of one volt.

AMPLIFIER.—This term is usually applied to an instrument using valves which has for its purpose the magnification of audio-frequency currents. For example, an amplifier is used with a public address outfit to amplify the relatively small currents of electricity in a microphone circuit or a gramophone pick-up so that a loud-speaker can be actuated. A valve is often referred to as an amplifier, though it is to be noted that all thermionic valves do not in fact amplify. A diode (two-electrode valve) is unable to amplify. Amplification is possible with a valve only when it is fitted with a grid or its equivalent in addition to an anode and cathode.

AMPLITUDE.—The maximum value of an alternating current; the maximum value of any periodically varying quantity during one cycle. *See* ALTERNATING CURRENT.

AMPLITUDE MODULATION. — To understand this it should first be appreciated that there are three characteristics of radio waves. These are velocity, frequency and amplitude. The velocity is fixed and unchangeable and is the same as that of light, i.e. approximately 300,000,000 metres a second. The frequency, the number of complete waves which pass a fixed point each second, can be varied. Normally, a transmitter sends its programmes or messages on a certain frequency and any receiver upon which it is desired to receive those particular programmes or messages must be tuned to the same frequency.

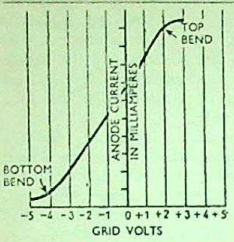
The amplitude of the waves is a measure of the amount of energy they represent; a ripple on a pond has a very small amplitude and a big sea wave has a large amplitude.

Hitherto, the usual method of imposing speech and music on radio waves has been to cause the amplitude of those waves to rise and fall in accordance with the various speech and music frequencies. This is amplitude modulation. There is, however, another method of modulation as applied to radio waves known as frequency modulation where the amplitude remains constant and the frequency is varied in accordance with the speech and music frequencies.

ANODE BEND.—If the voltage on the grid of a valve is changed there will be a change in the anode current that flows. At certain points there will be more abrupt changes and it is such a point that is called an anode bend. For example, when there are nine volts negative on the grid of a particular valve, there might be negligible anode current flowing. As this negative

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Characteristic curve of relation between anode current and grid volts at a given anode voltage

grid bias is reduced, appreciable anode current begins to flow and gradually increases as further reduction is made. Then from, say, four volts negative, there is a much greater increase of anode current. The point where there is this abrupt commencement of the greater effect on the anode current is known as the *bottom bend*. The *top bend* is where there is suddenly another change; this time, increases of positive grid voltage suddenly begin to introduce much smaller increases of anode current.

ANODE BEND DETECTION.—Detection is possible with a three-electrode valve if its grid is biased to either the bottom bend or the top bend of the grid volts/anode current characteristic. Then the effect of any alternating current on the grid will be to alter the anode current more in its one half-cycle than in the other half-cycle. For example, in the case of bottom bend detection, the negative half-cycles of the alternating current will have little effect on the anode current as compared with the positive half-cycles and thus detection is possible.

ANODE CIRCUIT.—This is the closed circuit which is formed by the cathode-to-anode path inside a valve and the coupling impedance (such as the primary winding of a transformer) and high-tension supply (such as an H.T. battery) external to the valve.

ANODE CURRENT.—The current in the form of a stream of electrons which flows from the cathode to the anode of a valve.

ANTENNA.—This is really a synonym for aerial, though it is sometimes applied to certain special aerial arrangements. *See* AERIAL.

APERIODIC.—A term used to describe an aerial or a coil in a wireless set that responds to a wide range of frequencies, instead of being selective in the sense that it responds better to one particular frequency or band of frequencies than it does to others.

APPLETON LAYER.—Also known as the F Layer, this is one of the several ionized layers surrounding the earth which tend to reflect radio waves. Named after its discoverer. *See* HEAVISIDE LAYER.

ARMATURE.—That part of an electric generator in which the electomotive force is produced. In a direct current generator, it is the rotating part, but very often in alternating current generators it is the stationary part. The term is also used to describe the moving part in a magnetic circuit, such as in the case of an electric relay or a loudspeaker of the moving-iron type.

ATMOSPHERICS. — Electric disturbances in the atmosphere mostly caused by thunderstorms near or distant which are heard in a radio receiver as crackling noises. There is no way of eliminating them entirely. They can often be avoided by tuning a receiver to a different wave-band and their effect is sometimes less marked when a nearby broadcasting station is being received if the aerial is disconnected.

ATTENUATION. — A diminution of current, voltage or power. The term is also applied to the falling off in strength of radio waves as with increasing distances from the transmitter.

AUDIO FREQUENCY.—The frequency of an electric current of an alternating nature which, when converted into air vibrations, becomes a sound.

AUTODYNE.—An abbreviation of auto-heterodyne. It is a receiving set in which the one valve acts as both a detector and a generator of local oscillations.

AUTOMATIC GAIN CONTROL. — A system which enables a radio receiving set automatically to adjust itself to variations in the strength of a transmitting station. Variable-mu valves (q.v.) are used in the system. These are high-frequency amplifying valves having effectiveness of amplification which can be varied by means of variations in their grid bias. A proportion of the energy from the detector valve is fed back to one or more such valves. If the strength of the signal decreases owing to fading, less of this energy is fed back and there is greater amplification by the variable-mu H.F. valves to compensate for the weaker signal. On the other hand, as the signal increases in strength, more energy is fed back from the detector and increases the negative bias on the variable-mu valves and so reduces their amplifying powers.

The working of the automatic grid bias can often be noticed by fluctuations in the loudness of the background as the amplification (gain) of the set swings up and down.

AUTOMATIC VOLUME CONTROL.—Another name used for Automatic Gain Control.

AUTO-TRANSFORMER. — A transformer which has only one winding. The whole of this winding may be used as the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

primary and a part of it tapped off as a secondary winding, or vice versa.

BACKLASH.—There is both electrical and mechanical backlash. Electrical backlash is the condition where oscillation is maintained in an oscillating valve circuit with smaller feedback than is needed for its inception. Mechanical backlash is rather loosely used to describe "play" between a control knob and the moving part or parts of a variable condenser or other adjustable component.

BAFFLE.—A rigid structure having as its purpose the maintenance of an even distribution of sound waves. A loudspeaker requires a baffle in the form of either a flat board with the loudspeaker diaphragm in the centre or a properly designed cabinet, in order to prevent the lower frequencies from curling round from the back and front of the diaphragm and becoming neutralized. That is why a loudspeaker not having a baffle or cabinet sounds extremely high pitched and shrill.

BAND-PASS FILTER.—A filter that is designed to pass a band of frequencies lying below an upper and above a lower limit, to the relative exclusion of all other frequencies.

BANDSPREADING.—On the tuning dial of an ordinary radio receiver, several transmitters may be located within the limits of a comparatively small movement of that dial. Bandspreading is the spreading out of those stations over the whole motion of the dial by some adjustment of the tuning circuit, or the spreading of the stations over the whole of an auxiliary dial.

BARRETER.—This usually takes the form of an iron wire in a bulb containing hydrogen. The device varies in resistance as with fluctuations in current passing through it so that it ensures a constancy of voltage over a wide range. In appearance it resembles an electric lamp; it serves to maintain a uniform flow of current in a circuit.

BATTERY.—A primary battery comprises two or more primary cells connected in series. (*See* PRIMARY CELL.) It generates electricity by means of chemical action. The most widely-used primary cell is the Leclanché (q.v.). A secondary cell (*see* ACCUMULATOR) is reversible in its action. Not only does it transform chemical energy into electrical energy, but when it has an electrical current forced through it, it again becomes charged with the chemical energy needed to produce current.

BATTERY CHARGING.—This is quite a practical proposition for the amateur. Battery chargers are obtainable suitable for either D.C. or A.C. mains for charging both car and radio accumulators. It is important to remember that while it does not matter which way round an A.C. charger is connected to the mains, a charger connected to D.C. mains must be connected up the right way or the accumulator will be seriously affected. Also, on any mains and with any type of charging apparatus, the accumulator must always be connected the right way round.

If, after a charge, the acid level in the accumulator falls below the tops of the plates, some distilled water must be poured in to raise the level. Regular charging, at a current not exceeding that recommended by the makers, is good for an accumulator and no harm will result if the periods of charging are more frequent or longer than those actually needed.

The vent plugs of an accumulator must be removed before charging commences in order to allow for a free escape of gas. This will be an inflammable gas, so that no naked lights must be allowed near the charging gear. The approach of the completion of the charging will be signified by an extremely free gassing, with numerous bubbles rising through the liquid in the accumulator cells. Voltmeter and acid tester readings must, however, be taken if precise indications of the full charge are required. *See* ACCUMULATOR.

BATTERY ELIMINATOR.—A unit that renders the current from mains suitable for replacing batteries used with a battery-driven radio set. An H.T. battery eliminator replaces an H.T. battery. Some A.C. battery eliminators provide grid bias and filament current as well. Trickle chargers for providing a low battery charging current for an accumulator are often combined with battery eliminators.

BEACON.—Radio transmitter that radiates waves in a sharply-defined beam to act as a marker or guide for ships or aircraft.

BEAM SYSTEM.—Highly directional transmitter and receiver designed to provide communication between two fixed points.

BEAT FREQUENCY.—The difference frequency which is produced when two different frequencies are mixed. The supersonic frequency in a superheterodyne receiver (q.v.).

BLIND SPOT.—An area of very low field strength due, for example, to the natural configuration of the ground. Blind spots sometimes exist in hilly country and in such spots reception of broadcasting is difficult even though the transmitter may be, comparatively speaking, quite near. There will also be blind spots in short-wave transmission and reception, when the direct waves have attenuated to the extent that they are not received. *See* SHORT WAVES.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BROADCASTING.—Some experimental radio telephony transmissions were carried out in Great Britain early in 1920. But the first broadcasting did not commence until 1922, when the Radio Society of Great Britain obtained permission to transmit a weekly half an hour of entertainment. The transmitter was at Writtle, in Essex, and had a power of only ¼ kW. Modern transmitters have powers up to 50 kW. and over.

The British Broadcasting Company, an amalgamation of commercial radio interests, was inaugurated later in the year and broadcasting transmitters were brought into operation in London, Birmingham and Manchester.

This company became the British Broadcasting Corporation in 1927, a public corporation having a body of governors appointed by the Crown. They are bound by the terms of a charter to act as trustees for the national interest.

By the end of 1924 there were 1,000,000 broadcast licences. The number rose to 9,000,000 during the subsequent fifteen years and is now over 10,000,000.

Broadcasting involves the use of one transmitter or a series of transmitters effectively disposed at different places and radiating radio waves as equally as possible in all directions. Each transmitter broadcasts on a fixed frequency and can be received on receiving sets that are tuned to that frequency.

The technique of broadcasting has become highly complicated but in broad outline it is as follows. There are studios for the performances, usually accessibly situated in the largest city or cities of the area to be served by the broadcasting.

The electrical currents from the microphones in the studio from which an entertainment is being broadcast are taken to balance and control panels where the mixing of effects such as incidental music, "artificial echo," etc., is carried out. There is also control of the outputs of the various microphone circuits and of overall intensity so as to keep it within the upper and lower limits required for good audibility without overloading when very loud sounds are being dealt with.

After amplification, the electric currents are taken to a central control room where the programmes from the various studios and outside locations are centralized for passing on to the transmitter through a special landline.

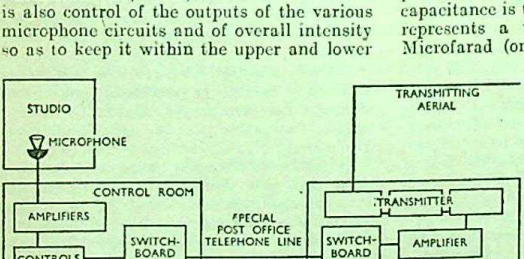
The transmitter is usually situated at some convenient point outside the town and may be some miles away from the studios.

Broadcasting in some countries, including the United States, is on a commercial and competitive basis. There is in the U.S. a national control of wavelength allocations, but privately owned transmitters are free to broadcast programmes sponsored by advertisers.

BYPASS CONDENSER.—A condenser having a sufficiently high capacitance to offer a low impedance to radio frequencies, but a high impedance to low frequencies. Connected across certain points in a circuit, it will bypass currents of radio frequency without appreciably affecting the low frequency functions of the circuit.

CALIBRATION.—Determining by experiment exact values on a scale of an arbitrary character. For instance, a variable condenser often has a dial with equally-spaced marks, these being numbered from 1 to 100 or 1 to 180. These marks indicate nothing except, in conjunction with a fixed spot or line, the relative positions of the moving vanes of the condenser. Calibration of the dial would mean charting either the values of capacitance the numbered marks indicated, or the wavelengths or frequencies they represented when the condenser was used in a tuning circuit of a radio receiver.

CAPACITANCE.—Also known as capacity. This is the ratio of the quantity of an electrical charge on a conductor to the potential of that conductor. The unit of capacitance is the Farad. But as the Farad represents a very large capacitance, the Microfarad (one millionth of a Farad) has become, in radio, the practical unit of capacitance.



Broadcast transmitters are usually situated outside the largest city in the area each transmitter mainly serves. They are connected to the studios by means of land lines

CAPACITIVE COUPLING.—The coupling of two circuits by means of a common capacitance or through a link in the form of a capacitance.

CAPACITY. — A term that is often employed as a synonym for capacitance. More correctly it is defined as the ability of an accumulator to hold a charge. The unit employed in regard to an accumulator's

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

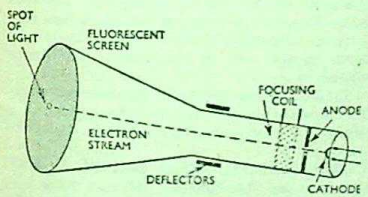
Digitized by Arya Samaj Foundation Chennai and eGangotri

capacity is the ampere hour. *See* AMPERE-HOUR CAPACITY.

CARRIER WAVE.—The high-frequency electro-magnetic wave radiated by a wireless transmitter as the result of the radio-frequency oscillations generated in the apparatus and communicated to its aerial system. The speech-frequency currents produced in the microphone circuit are amplified and then made to modulate the radio-frequency currents. Thus, the radiation from a broadcasting station is a modulated carrier wave. An unmodulated carrier wave can be used for morse signalling if sent out in short and long bursts to correspond with the morse code. *See* CONTINUOUS WAVES.

CATHODE.—The electrode in a thermionic valve from which electrons are emitted. In the battery valve, the cathode takes the form of a thin wire of high resistance. It is usually referred to as the filament. This filament is raised to a comparatively high temperature by the current from the L.T. (low tension) battery and electrons in great numbers are boiled off, as it were. Most mains valves have indirectly heated cathodes; in a valve of this type the cathode has its temperature raised to the required degree by conduction from the heater through which the mains current passes. *See* HEATER.

CATHODE-RAY TUBE.—This can be thought of as a development of the radio valve. There is a glass bulb from which



Simplified representation of a cathode-ray tube employing electrostatic deflection

as much as possible of the air has been exhausted. And there is a cathode from which electrons are emitted. But these electrons are made to form a thin beam which can be controlled as to its direction like a searchlight. At the end of the tube is a fluorescent screen which emits a pin-point of fluorescence at the spot where the electron beam strikes it. The beam can be made to swing in one direction or another, either by electrostatic or magnetic means, and build up lines or patches of fluorescence on the screen.

Cathode-ray tubes are used in oscillographs to give visual indications of what is happening in an electric circuit. For example, alternating current can be shown as a line of light in the form of a wave. Any distortion in the wave form is at once apparent.

Cathode-ray tubes are also employed in television receivers. *See* TELEVISION.

CHARACTERISTIC CURVE.—A graph which shows the relationship between two quantities in order to illustrate the performance of, for example, a thermionic valve. A frequently encountered characteristic curve is the plotting of grid volts and anode current; it shows at a glance how much anode current flows for a given anode voltage when the grid is at a certain potential. Often a characteristic curve may be a straight line for the greater part of its length!

CHASSIS.—The framework on to and into which the components of a piece of radio apparatus are assembled. A modern radio receiving set usually has a metal chassis that is at earth potential and through which all points in the circuit at earth potential are connected. In some special cases, however, the metal chassis may be raised above earth potential and so it is never safe to take it for granted that a chassis corresponds with "earth."

CHOKE COUPLING.—The linking of stages of an amplifier by means of a choke. A high- (radio) frequency choke is a winding having an air core or a dust-iron core which offers a high impedance to currents of radio frequency, and a low-frequency choke (which almost invariably has an iron core) a high impedance to audio-frequency currents.

CIRCUIT.—A continuous path for an electric current.

CO-AXIAL CABLE.—This comprises an electrical conductor held in the centre of a tube, the insulation of this conductor being mainly air. By such a cable, currents of very high frequency can be conveyed over considerable distances. Whereas ordinary cables would be useless for the purpose owing to the severe attenuation which would occur. Co-axial cables are employed to carry television transmissions, and it is interesting to note that greater distances can be covered by such means than by radio. For example, although in the normal way it would be impossible for anyone in, say, Birmingham to receive television programmes transmitted by wireless from London, it is possible for London transmissions to be sent via a co-axial cable for re-radiation by a radio transmitter in Birmingham.

COIL.—A winding of wire having as its purpose the provision of inductance.

COMPONENT.—The individual parts of a radio set assembly are called components.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Valves, batteries and loudspeakers are usually called accessories.

CONDENSER.—A component of a radio set especially designed to possess capacitance. But the modern tendency is to drop this term condenser from radio terminology in favour of the more precisely descriptive term capacitor. *See* FIXED CONDENSER, VARIABLE CONDENSER.

CONDUCTOR.—Any substance which offers comparatively low resistance to the passage of an electric current. Silver, copper, lead and all the other well-known metals are conductors.

CONTINUOUS WAVES.—Unmodulated carrier waves from broadcasting stations, such as are radiated when the microphone is switched out of circuit, are continuous waves. As explained in the entry on CARRIER WAVE, they can be used for signalling. But continuous-wave morse signals cannot be heard on an ordinary wireless set unless there is a local oscillator in that set to produce oscillations of a different frequency and so set up a beat frequency.

CORE.—That part of a magnetic circuit round which a winding is placed. It does not necessarily have to be of iron or steel; indeed, in many cases there may be an air core. The whole of the magnetic circuit of a transformer is referred to as the core.

COUNTERPOISE EARTH SYSTEM.—Wires near to the ground and having a large capacitance and which are used instead of a direct earth connection to a receiver or transmitter.

COUPLING. — The transference of energy from one circuit to another.

CROSS MODULATION.—The impression of one modulated carrier on another.

CRYSTAL DETECTOR. — A device which conducts small electric currents better in the one direction than it does in the other. There are many different types, but one that has proved efficient and reliable comprises a piece of bornite in light contact with a piece of zincite. *See* DETECTION.

CRYSTAL RECEIVER.—The simplest type of radio receiver, in which the essential component is a crystal detector. Such a receiver need consist only of a coil of wire to bring the aerial approximately to the tuning required, a crystal detector and headphones.

CURRENT.—Flow of electricity through a body. The unit of current is the ampere (q.v.).

CYCLE.—The complete series of changes in a quantity that periodically varies.

DAMPING.—The rate at which vibrations, such as the oscillations in a radio circuit, disappear. The term is also applied to the reduction of the vibration of the needle of an electrical instrument carried out by either magnetic or mechanical means so that dead-beat readings are given.

D.C.—An abbreviation of direct current (q.v.).

DECOUPLING.—The prevention, or at least reduction, of coupling between two circuits.

DEMODULATION.—Synonym for detection (q.v.).

DETECTION.—The separation of the modulation frequencies from the carrier frequency upon which they are impressed. The electric current which is induced in a radio aerial by the radio waves from a broadcasting station is an alternating current, a current which alternates in direction, and which is varied in strength at the frequencies of the musical notes and speech sounds.

The simplest form of detection is with a crystal detector. This device permits current to flow in appreciable proportion in only the one direction. Therefore, if the modulated radio-frequency current from the radio aerial is fed into a circuit in which there is a crystal detector, the result is a current that flows in only the one direction and which varies in strength at speech and music frequencies. These current variations will operate headphones and these will transform them into sound waves.

DETUNING.—Altering the tuning adjustment or adjustments of one or more of the tuned circuits of a radio receiver so that it is not in tune with a given frequency. Detuning is sometimes resorted to as a means of reducing volume, but this is not a method to be recommended, as with many sets it inevitably introduces distortion.

DIAL.—This term is nowadays generally applied to any visible device in a radio set that is used for the adjustment of its tuning.

DIAPHRAGM.—That part of a loudspeaker or headphone which, when it vibrates, creates the air waves that are perceived as sound. In most loudspeakers, the diaphragm is cone-shaped so as to give it a maximum of rigidity with a minimum of weight.

DIELECTRIC.—The insulating material which separates the plates in a condenser is a dielectric. It may be air, mica, paper or some other material capable of supporting an electrical stress.

DIODE.—A two-electric valve. As there are only the anode and cathode and no grid in a diode, it is unable to amplify. Diodes are, however, used for rectification and detection in modern radio sets. *See* VALVE.

DIPOLE AERIAL.—An aerial consisting of a straight metal rod or wire approximately half the length of the radio wave

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

it is desired to receive. Connection to a dipole is made at the centre, at which the aerial may be broken for the purpose. Television aerials are usually vertical or horizontal dipoles.

DIRECT CURRENT.—Electric current which flows in the one direction only and does not vary appreciably in magnitude. The terms unidirectional current and pulsating current are generally used to describe a direct current which periodically varies in strength.

DIRECTIONAL AERIAL.—An aerial that receives or transmits more efficiently in certain directions than in others.

DIRECTLY HEATED CATHODE.—*See* FILAMENT.

DISTORTION.—A departure from an original wave form. Distortion in a radio receiver may be due to a number of reasons. Sometimes the distortion occurs at the transmitter or as a result of other transmission factors. Therefore, the first step in dealing with distortion is to determine whether or not it is caused by the receiving equipment. If the distortion is present in more than one programme to which the set is tuned, then it is fairly certain that something about the set itself is producing it.

Overloading of the valves or loudspeaker is a common cause, especially with listeners who demand greater volume than their sets can give without distortion, especially when near a broadcasting station.

The output capacity of a set is primarily governed by the emission of its valves and distortion will result if any of these is overloaded. Therefore, the distortionless volume obtainable will decline as valves become old and their emissions fall. The obvious remedy is to replace the valves. Most dealers will readily test valves for emission.

Another cause of distortion is a mechanical defect in the loudspeaker. Sometimes the speech coil gets out of centre and scrapes the poles of the field magnet. Gently pressing the diaphragm at various points while the set is working may show if it is a loudspeaker fault of this kind. A buzzing noise accompanying the speech and music is sometimes due to a turn of the wire on the speech coil of the loudspeaker being loose.

Distortion in a battery-driven set can be caused by any of the foregoing; in addition, an incorrect grid bias is a frequent possibility. This may be the result of the grid bias battery becoming exhausted or even disconnected. An adjustment of the grid bias will sometimes rectify distortion brought about by an H.T. battery that is beginning to run down, if the listener will be content with a reduced volume until such time as the H.T. battery can be replaced.

Faults in components, particularly those in a mains set which are in grid biasing arrangements, may introduce distortion. Noticeable distortion also results in many cases when one or more of the tuning circuits in a set are off tune.

Finally, unwanted feed-back between the circuits of a set is a frequent cause of distortion. However, such feed-back seldom occurs in a modern set without more serious trouble, such as an internal disconnection, being the direct cause. *See* OVERLOADING.

DOUBLE-DIODE.—A valve having two anodes and a cathode. It is used for full-wave rectification of mains current (q.v.). It is also to be found as a part of a multiple valve.

DOUBLE-DIODE PENTODE. — A multiple valve which is a double-diode and a pentode combined, but in which there is only the one cathode common to both sections.

DOUBLE-DIODE TRIODE.—The combination of a double-diode and a triode in the one multiple valve.

DOUBLE-POLE SWITCH.—A switch which makes or breaks on both poles at once.

DRY BATTERY. — Two or more Leclanché cells (joined in series to form a battery) and in which a paste is used instead of a solution of sal-ammoniac as in a wet battery. It will be seen, therefore, that it is not really dry, but is, at any rate, quite unspillable.

DRY ELECTROLYTIC CONDENSER.—This is an electrolytic condenser in which a paste is used for the negative pole. It is just sufficiently conductive to maintain the electrolytic action and form the oxide film on the aluminium electrode. *See* ELECTROLYTIC CONDENSER.

DUAL-AMPLIFICATION CIRCUIT.—A radio receiving circuit so arranged that the one thermionic valve in it is made to amplify at both radio and audio-frequencies simultaneously. It operates in this way. The energy from the aerial is fed to the valve and amplified. It then passes to either a crystal or valve detector for demodulation. The audio-frequency impulses are then fed back to the grid circuit of the amplifying valve through either a resistance capacitance coupling or an L.F. transformer, and the finally amplified energy is transferred from the anode circuit of the same valve to a loudspeaker or to a further L.F. amplifier.

EARTH.—An arrangement of plates or wires buried in the earth in order to make an electrical connection with the body of the earth.

EDDY CURRENT.—The current caused

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

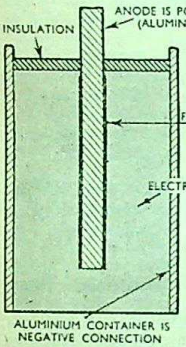
to flow in a conducting material by a varying magnetic field. In order to minimise eddy currents, which are a cause of loss, the cores of transformers are built up of thin sheets of iron. These sheets are called laminations.

ELECTRODE.—The terminal of an electric circuit. The anodes, cathodes and grids of thermionic valves are electrodes.

ELECTROLYTE.—A compound which can be decomposed by an electric current. The sulphuric acid solution in an accumulator is an electrolyte.

ELECTROLYTIC CONDENSER.—A type of condenser which has a high capacitance for a relatively small physical size. To understand why this should be so, one must first bear in mind the fact that the capacitance of a condenser depends upon three factors: 1. The area of its plates. 2. The nature of the dielectric. 3. The thickness of the dielectric. For a given area of plates, the thinner the dielectric the higher the capacitance.

The high capacitance of the electrolytic condenser is obtained by virtue of the extremely thin dielectric in it. In the one form of this type of condenser, the dielectric is a film of oxide on some aluminium foil. The aluminium acts as one plate and a solution of some non-corrosive salt as the other.



Section of an electrolytic condenser. It is not to scale; in practice, the oxide film covering the anode is extremely thin

It should be noted that these condensers are not all interchangeable with those which have mica or paper as a dielectric, because some can be used only in D.C. circuits and must be connected up correctly in regard to their polarities. This applies in general to the wet type, although this type has the advantage that it is more easily manufactured in some capacitances and voltages and, in the higher voltage ratings, will stand higher voltage surges without harm than the dry type.

But the dry type can be produced in any capacitances and voltages and for use in either D.C. or A.C. circuits. *See* DRY ELECTROLYTIC CONDENSER.

ELECTROMOTIVE FORCE. — The force which drives an electric current through a circuit. The unit of electromotive force is the volt.

ELECTRON.—A negative particle of an atom. It can be thought of as one of the fundamental particles of matter, or as the fundamental particle of electricity. A current of electricity is a flow of electrons which are impelled from where there is an excess of electrons to where there is a corresponding shortage.

ELECTRON CAMERA.—A television device which converts an optical image into electrical currents. *See* TELEVISION.

EMISSION.—The stream of electrons which flows from the cathode of a valve to the anode. The emission of a valve tends to grow less after the valve has been in use for a long time. A serious decline in the emmission reduces the valve's efficiency and it should then be replaced by a new one.

ETHER.—A substance which is supposed to permeate the whole of space, even the interstices of the atomic structure of matter. According to a widely accepted theory, it is through this ether that the vibrations of light and of radio are radiated. It is a convenient theory, but one that has never been proved to the satisfaction of all scientists.

FADING. — The diminishing of the strength of reception from a transmitting station due to disturbances in the upper layers of the atmosphere. Reception of the very distant stations is possible only because the waves from them are reflected back to earth from the ionized layers surrounding the earth instead of going straight off into space. Irregularities occurring in these layers affect this reflection and cause fading. *See* SHORT WAVES.

FAULT FINDING.—In a mains set, this is for the most part work for an expert equipped with the proper instruments. However, there are some faults that are almost self-evident. For example, if a valve that is known to show a glow in the normal way when the set is switched on does not show a glow, then it may need replacing. But it would be worth while ensuring that it is making good contact in its holder. Sometimes, interfering noises or even a complete failure is due to one or more of the valves coming loose in its holder and needing to be reinserted firmly. If the dial illumination fails and none of the valves reveals a glow, it is possible that a fault has occurred in the lead which connects the set to the power point. Or, maybe, the fuse in the power point circuit has blown. Should it again blow after being replaced, it is possible a short circuit exists in the set.

Noises can result from a loose aerial or earth connection, or if the aerial or aerial

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lead is scraping something that is conductive.

Poor volume can be caused by a loss of emission in the valves. But should the fault not be one of these obvious ones, the amateur is strongly advised not to remove the back of a mains set while it is switched on, and poke about in its interior. Numerous fatalities have occurred in this way.

A battery set is a different proposition. The only danger here is that the uninformed listener might burn out his valves if he prods about in the set's wiring while the set is switched on. But if the wiring is inspected carefully, it is sometimes easy to spot broken connections in it. The most frequent causes of battery set troubles are as follows: Burnt-out valve filament; valve or valves with poor emission owing to age; run-down batteries; disconnection either externally or internally.

Faults often occur in individual components. Volume controls and switches are frequent culprits. *See* DISTORTION, NOISE.

FEEDBACK.—The transfer of energy from the output of a valve to its input. It is often done deliberately, as in the case of reaction (q.v.). When there is unwanted feedback of any degree, there may, in consequence, be serious distortion, or the set may break into uncontrolled oscillation. Feedback that is partly acoustical can involve the loudspeaker, air vibrations from which cause vibrations in the receiver and set up current fluctuations. A bad case of this results in the loudspeaker developing a sustained howl.

FIELD WINDING.—The winding in a mains-energized, moving-coil loudspeaker which produces the required intense magnetic field.

FILAMENT.—The fine wire of high resistance in a directly heated valve which, when heated by the current that passes through it, emits electrons.

FILTER.—A device which discriminates in favour of one or more frequencies or bands of frequencies to the relative exclusion of all others. The connections of the filter in a circuit may be such that the selected frequency or frequencies are eliminated from a general body of frequencies. For example, the purpose of a scratch filter is to eliminate those frequencies from gramophone record reproduction which represent the scratch noise.

FIRST DETECTOR.—The detector part of a frequency converter in a superheterodyne receiver (q.v.).

FIXED CONDENSER. — A condenser having a fixed value of capacitance as against one the capacitance of which can be varied by adjusting a screw or a dial.

FLAT TUNING.—Tuning that is low in selectivity. A flatly-tuned circuit responds to a wide band of wavelengths. Interference from undesired stations is heard on a receiver that has flat tuning or, in other words, poor selectivity.

FLEMING VALVE.—A two-electrode valve. So-called after Sir Ambrose Fleming, who invented it. It was not until Lee de Forest introduced the third electrode, the grid, that the valve could be used as an oscillator and as an amplifier. The original Fleming valve could be used only for rectification.

FRAME.—One complete picture of the series of pictures necessary to give the illusion of movement in cinematography or television.

FRAME AERIAL.—*See* LOOP AERIAL.

FREQUENCY.—The number of cycles per second of an alternating current.

FREQUENCY CONVERTER. — The combined oscillator and first detector in a superheterodyne receiver which creates the intermediate frequency. *See* SUPERHETERODYNE RECEIVER.

FULL-WAVE RECTIFICATION.—A single two-electrode rectifier rectifies alternating current because it allows electricity to flow through it in only the one direction. That part of the alternating current which flows in the opposite direction is wasted. Only half of the alternating current wave is effective and passes through the device as a unidirectional current. It is possible to connect two rectifiers or a rectifier of the valve type having two anodes (double-diode) so that both half-cycles of the alternating current appear as unidirectional current flowing in the one direction. This is full-wave rectification. *See* RECTIFICATION.

FUSE.—A protective device consisting of a metal wire designed to melt and break a circuit when the current rises above a certain value. Fuses in radio sets and in electrical instruments are often of the cartridge type, small tubular affairs which are held in holders which enable them quickly to be removed and replaced. Sometimes flashlamp bulbs are used as fuses. One of the most important uses of fuses in a radio set is to protect the heaters or filaments of the valves against the H.T. voltage. No fuse should ever be replaced by one which blows at a higher current unless there is some special reason for so doing. There is no danger in using a fuse of lower current capacity in any circumstances, though it might not be able to carry the admissible current.

GANG CONDENSER.—Two or more variable condensers mechanically coupled so that they can be operated simultaneously by the one control.

GANGING.—The mechanical coupling of variable resistances, switches, variable

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

condensers or other adjustable devices so that they can be operated simultaneously by the one control. Ganged tuning circuits are tuning circuits tuned by gang condensers.

GRAMOPHONE PICK-UP.—A device for translating the waves in gramophone record tracks into varying electric currents, thus permitting gramophone records to be reproduced electrically. A pick-up can be fixed to a mechanical gramophone and its output taken to a radio set, providing this has the simple circuit adaptation needed.

GRID.—An electrode in a thermionic valve used either for controlling the electron stream or for screening. *See* VALVE.

GRID BIAS.—In the practical sense, this is the application of a voltage to the grid of a valve in order to bring that valve to a desired condition of working. Correct grid bias is essential to the proper working of an amplifying valve; therefore, it is important for the grid bias battery in a battery set always to be able to provide the full potential required. Grid-bias batteries should be tested at intervals and as soon as they show on a voltmeter that their voltages are falling off, replacement is essential. A faulty grid bias battery not only causes distortion but increases the drain on the H.T. battery and may shorten the lives of the valves concerned. Correct grid bias is equally important in the case of a mains set. A fault in a fixed condenser or resistance may cause it to be incorrect.

GRID LEAK.—A resistance of a relatively high value which provides a direct current path between the grid and the cathode of a valve, and permits the electrons which would otherwise tend to accumulate on the grid to leak back to the cathode.

HALF-WAVE AERIAL. — An aerial approximately half as long as the wireless wave which it is designed to receive.

HARD VALVE.—A valve that has been evacuated of all but a negligible residue of air, and has almost a perfect vacuum.

HARMONIC.—Any overtone that is an exact multiple of the fundamental frequency. For example, middle C on the piano has a frequency of 256 cycles per second. But that is only the fundamental frequency of that note. There are also some harmonics. The first harmonic is the fundamental frequency itself. The second harmonic of middle C is the C exactly one octave higher and which has a frequency of 512 cycles per second. The third harmonic is three times the frequency of the fundamental, i.e. 768 cycles per second in the above case, and so on. Harmonics occur in voltage and current waves of alternating current. *See* OVERTONE.

HEADPHONES.—Telephone receivers constructed so that they can be worn on the head. They are usually obtainable in both high and low resistance forms. The high resistance ones can be connected directly into a crystal or valve detector circuit. But low resistance headphones require to be used with a suitable step-down transformer.

HEATER. — The conductor in an indirectly-heated valve (q.v.) through which the L.T. current passes. It is electrically insulated from the cathode and heats it by heat conduction only.

HEAVISIDE LAYER.—The first to be discovered of the several electrified layers of air surrounding the earth, and which reflect back to earth some radio waves which would otherwise shoot off into space.

HEPTODE.—A seven-electrode valve which is sometimes called a pentagrid. It is used in superheterodyne receivers for frequency conversion. The cathode and the first two grids act as a triode and this is connected in circuit as the oscillator. The remaining four electrodes operate as the detector. As the one electron stream passes between all these electrodes it will be appreciated that it effectively couples the two sections, the three electrodes acting as an oscillator valve and the four which act as a detector. The meaning of the term electron coupling, which often appears in technical literature, will, therefore, be obvious.

HETERODYNE. — A beat frequency produced by the combination of two oscillating currents of slightly different frequencies.

HEXODE.—A valve having two screen grids and two control grids. *See* VALVE.

HIGH FREQUENCY.—A term rather loosely used to refer to all frequencies above the audible range. *See* RADIO FREQUENCY.

HIGH-FREQUENCY AMPLIFICATION.—More correctly, this should be termed radio frequency amplification. It is the amplification of the currents in a receiving aerial prior to detection. Generally speaking, high-frequency amplification increases the sensitivity of a receiver; it permits it to receive distant stations which would otherwise not be heard, while low- (audio) frequency amplification, which occurs subsequently to detection, raises the volume to the level required for operating a loudspeaker satisfactorily.

HIGH-TENSION BATTERY. — The battery which supplies the anode currents in a radio set of the battery type. It usually comprises a number of small dry cells connected in series and assembled in the one case. Sockets are provided for connecting purposes. The so-called "super" H.T. battery is one that has comparatively

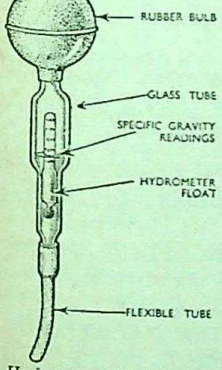
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

large cells from which higher currents can be taken, as is necessary if there is a relatively large power valve or a large number of valves in the set. Current does not normally flow from an H.T. battery connected to a radio set when the filaments of the valves are not heated.

HOWLING.—There are various causes of howling. Radiation from a nearby radio set of the reaction type which is being mishandled may cause violent howling, and there is no remedy for this except to tune one's set to a different station from that which is being heterodyned by the interference. An unwanted feedback in a receiver will sometimes produce a sustained howl. But the design of modern radio set components and valves, and of the sets themselves, is such that this is not nowadays the frequent trouble it used to be.

HUM.—There is generally at least some hum present in most sets that are connected to the mains. If a set suddenly begins to hum loudly, it may indicate an internal fault such as a disconnection or a fault in a component. There would be less hum on many sets that are otherwise quite satisfactory if more listeners were to employ efficient earths. There is a modern tendency that is to be deplored to dispense altogether with an earth connection. Except in the case of some portable sets, there always ought to be an efficient, direct connection either to a cold-water pipe or to a metal plate or rod buried in the ground. Hum is also sometimes less in a mains set if there is a good aerial instead of a small, inefficient one, as this enables a set to be operated at a lower level of sensitivity on all but the most distant stations.



Hydrometer float is embodied in this acid tester for determining the specific gravity of the electrolyte of an accumulator

Further to avoid hum, all the external leads of a set except, of course, the mains lead, should be kept as far as possible away from the mains or other devices connected to the mains. The mains leads should not be allowed to run near loudspeaker leads or the aerial lead. *See also* EARTH; MAINS RECEIVER; RECEIVER.

HYDROMETER.—Device for testing the specific gravity of fluids, especially, in radio, that of the acid solution in an accumulator. *See* BATTERY CHARGING.

I.F. — Abbreviation for intermediate frequency (q.v.).

IMPEDANCE. — The total effective opposition offered to an alternating current by a circuit containing the combination of the reactances of either inductance or capacitance, or both, in addition to resistance (which is always present in every circuit to a certain degree). In such a circuit the simple application of Ohm's Law cannot be applied.

INDIRECTLY HEATED VALVE.—A valve, the cathode of which is brought to the required heat by means of a heater whose only function is the provision of that heat. If a directly heated valve were used in an A.C. mains set, elaborate rectifying and smoothing arrangements would be needed, otherwise the alternations of current in the valve filaments would cause a deafening hum. But no mains current flows through the cathode of an indirectly heated valve; it derives its heat by conduction from the heater.

INDUCTANCE.—This is a property of an electric conductor which opposes any change in current flow. It offers opposition to the current as it builds up and tends to prolong its flow after it would otherwise cease to flow. The unit of inductance is the Henry.

INDUCTOR.—A component designed to contribute inductance to a circuit. It usually takes the form of a coil of wire, which is popularly referred to as an inductance or tuning coil.

INSULATION.—The isolation or separation of an electrical conductor or piece of apparatus by non-conducting material.

INSULATOR.—A device or material for providing insulation.

INTERFERENCE.—Any programme or noise, other than that caused by the station it is desired to receive, that appears on the same wavelength. If it is loud interference on precisely the same wavelength, there is nothing that can be done to cut it out. If the interference is not very loud and is high pitched, it can sometimes be considerably reduced by the adjustment of a tone control, though the programme to which one is listening will lose quality to some extent.

INTERLACED SCANNING.—Method of line scanning used in television whereby successive frames (q.v.) are scanned in such a way that the lines in one are in spaces left in the other.

INTERMEDIATE CIRCUIT. That part of a superheterodyne [illegible] which the energy is amplified at [illegible] frequency (q.v.). *See* SUPER[illegible] RECEIVER.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

INTERMEDIATE FREQUENCY. — The frequency of the energy output from the frequency converter in a super-heterodyne receiver (q.v.).

INTERVALVE COUPLING. — The coupling between two valves so that the anode current variations in the one are passed on to the other and set up variations in its grid circuit.

IONIZATION.—Displacement of electrons in a gas which causes the gas to become conductive to electricity. The action of the light from the sun's rays produces ionization in the upper layers of the atmosphere.

IONOSPHERE.—Region in the atmosphere where ionization occurs. One of the layers in it which has definite characteristics is the Heaviside layer (q.v.).

JAMMING.—Interference with a transmission by another station, either deliberately or unintentionally.

KILOCYCLE.—One thousand cycles.

KILOWATT.—One thousand watts.

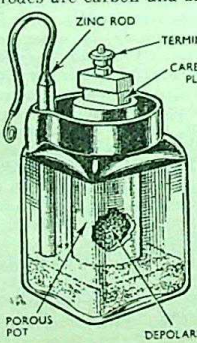
kW.—Abbreviation for Kilowatt (q.v.)

LEAD-IN.—The wire connecting the down lead of an outdoor aerial with a radio set installed indoors. It is frequently merely the continuation of the down lead which serves this purpose. It should be well insulated and not permitted directly to come into contact with walls, window frames, etc.

LEAD-IN INSULATOR.—An insulator designed to provide insulation for an aerial lead-in. Special types are available for permanently fixing into window frames or walls and provided with a conductor having one terminal on the outside and another on the inside, thus permitting easy and efficient connection between an aerial down lead and a set.

LEAKY GRID DETECTION. — A method of detection (with a valve) using a grid leak and a condenser.

LECLANCHÉ CELL.—A primary cell in which the electrodes are carbon and zinc and the electrolyte is a solution or paste of sal-ammoniac. In order to reduce polarization, a depolarizer consisting of manganese dioxide is held round the carbon electrode by means of a porous container, porous so as to enable the electrolyte to get through and act on the carbon.



Leclanché cell with the porous pot cut away to show the depolarizer surrounding the carbon

LIGHTNING ARRESTER.—A device which safeguards a radio receiver by offering, to any current which might be generated in the aerial by lightning, a low-impedance path to earth.

LOADING COIL.—A coil having as its purpose the increasing of the natural wavelength of an aerial or that of a resonant circuit.

LOCAL OSCILLATOR.—An oscillator in a radio receiving set for generating beat frequencies. *See* BEAT FREQUENCY; SUPER-HETERODYNE RECEIVER.

LOOP AERIAL.—An aerial comprising one or more complete turns of wire, generally in the form of a rectangle. It is the basis of most ordinary direction-finding systems, for it has marked directional qualities. A loop aerial receives most efficiently when it is in line with the direction of a transmission and least efficiently when it is at right angles to it.

LOUDSPEAKER.—A radio device necessary for the conversion of electric current variations into sound waves. In the moving-iron type, the current variations cause a magnetic field to fluctuate and vibrate a piece of iron which is attached to the diaphragm.

In the moving-coil type there is an action similar to that in an electric motor. There is a strong magnetic field set up either by a powerful permanent magnet or a mains-energized electromagnet. Between the poles of this magnet is suspended the speech coil connected to the output of the set. This coil is fixed to the apex of the cone diaphragm. The variations in the current passing through the speech coil set up a varying magnetic field that reacts with the field of the magnet system and causes the coil to vibrate.

The majority of moving-coil loudspeakers are of low impedance and require to be connected to a set through a transformer in order that there shall be an efficient matching (q.v.).

LOW FREQUENCY.—A term often used as a synonym for audio frequency (q.v.).

LOW TENSION.—A term rather loosely applied to heater and filament voltages, circuits, etc.

L.T.—Low Tension (q.v.)

MAINS.—Abbreviation for power supply mains.

MAINS AERIAL. — The use of the mains as an aerial can be accomplished merely by joining the aerial terminal of a set to one of the mains lead wires through a fixed condenser of low capacitance. The low capacitance of this condenser opposes

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the low-frequency alternations of the mains current (in the case of D.C. mains it acts as a complete barrier to the D.C.) while permitting the passage of the radio-frequency currents generated in the mains by wireless transmissions. The connection should, however, be made only by a qualified expert as otherwise it might endanger the set or its user. In some circumstances, mains aerials are not successful owing to the liability of mains to carry radio-frequency interference.

MAINS RECEIVER.—A receiver which derives the current for actuating the heaters of its valves directly from the mains. Although a mains receiver takes comparatively low currents as compared with electric radiators, cookers and other domestic devices, it should be remembered that there will be high voltages in its mains connecting leads and in its components. It should, therefore, be regarded as a power installation and treated with respect and caution.

MAINS UNIT.—Term often used to describe a unit rendering it possible to derive current from the mains for a battery set. Also known as a battery eliminator (q.v.).

MATCHING.—To obtain the greatest efficiency in the transfer of power into a load, it is necessary for the load to have a certain impedance in comparison with that of the source. For example, the most efficient results are given when the impedance of a loudspeaker is correctly matched to that of the output valve of a radio set. That is why not all loudspeakers will work equally well on all radio sets, unless there is a transformer intervening which is adjustable so as to provide the required matching.

MEGACYCLE.—One million cycles.

MEGOHM.—One million ohms.

METAL RECTIFIER. — This is a rectifier which depends for its functioning on the unidirectional conductivity of a layer of metal oxide on a metal disc. Usually copper oxide and copper are used. The discs can be connected in series so as to handle higher voltages or in parallel to handle higher currents. They can also be arranged to provide full-wave rectification (q.v.).

METER.—A measuring instrument. Often, a domestic supply meter. *See* AMMETER; VOLTMETER.

METRE.—Metrical unit of length equal to 39.37 inches. It is applied to the lengths of wireless waves, though these could be expressed in inches, feet or any other units of length, if desired.

MICA CONDENSER. — A condenser using mica as the dielectric.

MICROHENRY.—Millionth of a Henry.

MICROPHONE.—A device for translating sound vibrations into voltage or current variations. One type employs carbon granules which introduce variations of resistance into an electric circuit in accordance with the variations in mechanical pressure on them. Other types actually generate currents that vary in accordance with the frequencies of the sound waves. One of these is the moving-coil type in which the diaphragm causes a coil to vibrate in a magnetic field.

MICROPHONIC NOISE.—Noise due to mechanical vibrations of the electrodes of a valve. With modern valves, this is not frequently a serious trouble.

MILLIAMMETER.—A measuring instrument which provides direct reading in milliamperes (thousandths of an ampere) of the current flowing through it.

MIXER.—A device in which currents of different frequencies are combined. *See* SUPERHETERODYNE RECEIVER.

MODULATION. — Variations in the frequency or amplitude of a high frequency current at some lower frequency or frequencies.

MODULATOR.—The term applied to a valve or other device in which modulation takes place.

MOVING-COIL INSTRUMENT.—An electrical measuring instrument which operates on the moving-coil principle. The needle is mechanically coupled to a coil that is situated in a magnetic field and, owing to its interaction with it, takes up a position depending upon the current to be measured.

MOVING-COIL LOUDSPEAKER. — *See* LOUDSPEAKER.

MOVING-IRON INSTRUMENT. — Electrical measuring instrument depending for its working on the movement of a piece of iron relative to the magnetic field of a coil through which passes the current to be measured.

MULTI-MU VALVE. — Synonym for variable mu valve (q.v.).

NATURAL FREQUENCY. — Of an aerial, the frequency at which the aerial will resonate without any loading inductance.

NATURAL WAVELENGTH.—Of an aerial, the wavelength of a transmission to which the aerial will respond when there is no loading inductance. The term is interchangeable with Natural Frequency, so long as the appropriate units are used in each case.

NIGHT EFFECT.—Also called Night Error and Night Polarization, this is the error that tends to occur in radio direction-finding at night. It is especially noticeable on the short waves and is due to the occurrence of irregularities in the ionized region

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the upper atmosphere. *See* SHORT WAVES.

NOISE.—There are various causes of noise that accompanies loudspeaker reproduction from a radio set and may at times seriously interfere with reception. Cracklings and sizzlings may be due to atmospherics (q.v.). There will always be some atmospheric noise present though often it may, happily, be practically inaudible, but it will become louder as the sensitivity of a set is increased in order to receive a distant station.

Noises will also come in via the mains on a mains-driven set. The operation of electric light and power switches will sometimes make crackles, and if there is a faulty switch or an electric device in which a continuous spark occurs, the noise on a nearby radio might be considerable. The motors of refrigerators and vacuum cleaners may produce noises, especially if there is undue sparking during their operation.

It is possible to eliminate much of the interference from such sources that comes in from the mains, by the use of a filter connected across the mains at the point where the set is connected. But some of the noise may be borne in by radiation and picked up by the aerial of the set. The only cure for this is to suppress the interference at source, if that can be done.

When there is considerable amplification, noises may be generated in and amplified by the set. Some valves are noisier than others. Faulty H.T. and grid bias batteries in a battery set will cause noise to appear. Bad contacts are also frequently responsible. Valves loose in their holders, loose aerial or earth connections, loose contacts somewhere in the mains connections; any of these may generate enough noise to drown the programmes. Tapping parts of the outside of the set often gives a clue as to whether or not some faulty connection in the set is to blame; sometimes a vigorous tap will silence the noise by temporarily making good the contact.

OCTODE. — A multiple valve having eight electrodes and used in superheterodyne receivers as a frequency converter. The first three of the electrodes, the cathode and two grids, function as a three-electrode valve coupled by the common electron stream to the following five electrodes which act as a pentode. In fact, the octode is similar to the heptode, which is in effect a combination of a triode and a tetrode, except that a pentode replaces the tetrode.

OHM.—Practical unit of resistance.

OHM'S LAW.—Upon this law is based one of the most widely applied sets of expressions in the science of electricity. First of all, let us take resistance. For a given voltage, the current that flows in a D.C. circuit depends upon the resistance of that circuit. The greater the resistance the less the current; the less the resistance the greater the current. This is for a given voltage. But the current flow also depends upon the electrical pressure or voltage that is driving the current through the circuit. The bigger the voltage for a given resistance the greater the current; the smaller the voltage the smaller the current. These relationships are based on Ohm's Law and can be expressed very simply as follows: E (voltage) = R (resistance) × C (current) and $R = \frac{V}{C}$ and $C = \frac{V}{R}$ when voltage is in volts, current in amperes and resistance in ohms.

Thus, if any two of the quantities are known, it is a simple matter to find the unknown one. An extremely easy way to learn these expressions is to print the following fairly large on a piece of paper: $\frac{V}{C \times R}$ If you hide one of these letters with a finger the hidden letter becomes the unknown quantity and the remaining ones tell you how to calculate it.

The basic principles of the above expressions apply to A.C. circuits, though in this case impedance replaces resistance, except in a purely resistive circuit, and there are matters such as phase and power factor to be considered.

OSCILLATION. — For practical purposes, this can be defined as an electrical vibration such as occurs in a tuned circuit when it is being subjected to impulses of radio frequency current from an aerial or a valve oscillator.

OSCILLATOR.—The part of a radio transmitting set that generates the rapid electrical vibrations necessary for creating radio waves. Also the section of a receiving set of the superheterodyne type comprising a valve and associate circuits which produce oscillations for mixing with the received oscillations. *See* SUPERHETERODYNE RECEIVER.

OUTPUT.—The useful output of a radio set is obviously limited by the operating capabilities of its output valve. This will not handle more than a certain amount of energy for amplification without overloading and distortion taking place. But overloading may occur at one of the earlier valves in the set before the output valve is fully loaded, though this should not happen in a properly designed set in which all the valves are in good condition. Frequently, however, the maximum output of a set is greater than its loudspeaker can handle.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

For reproduction sensibly free from distortion due to overloading at any point, a set should be worked somewhat below what may be considered to be its maximum volume. Then there will be less likelihood of sudden and perhaps momentary increases in the strength of the programme running the set into unpleasant effects of overloading. Of course it is desirable that a set should be so designed that it can be at all times run "full out" without valves or loudspeaker being overloaded. Efficient automatic gain control can help this to be done.

The output rating of a radio set is based upon that of its output valve. For comfortable loudspeaker reception in an ordinary room, a fraction of a watt may be ample for the non-critical listener. But it is impossible for a set to give good reproduction of the low notes unless there is fair margin of power for their reproduction.

OUTPUT CIRCUIT.—The circuit of a radio set to which a loudspeaker is coupled.

OUTPUT IMPEDANCE.—The impedance of an output circuit.

OUTPUT TRANSFORMER.—A transformer used for matching (q.v.) the impedance of a loudspeaker to the impedance of the output circuit of a receiving set.

OUTPUT VALVE.—The valve in the anode circuit of which appears the current for operating the loudspeaker of a radio receiver. A loudspeaker is a power and not a voltage operated device. It requires both current and voltage, whereas it is voltage that actuates amplifying valves. Therefore the output valve must be a power valve, for it is not purely a voltage amplifier.

OVERLOADING.—This can occur in either a microphone or a valve or a loudspeaker when the input is greater than it is able to handle without distortion occurring. The symptom of overloading is an easily recognizable and strident blurring of the reproduction.

OVERTONE.—Any of the components higher in frequency than the fundamental frequency in a complex wave form. If it were not for overtones it would not be possible to distinguish between a tin whistle and a "Strad" violin on any set, however good. As the overtones range into the higher frequencies, it is essential for a radio set to have a good high note response, otherwise the distinctive characteristics of voices and musical instruments will tend to be absent.

PACK. — An abbreviation for power pack (q.v.).

PADDING CONDENSER. — A small adjustable condenser used in series with the normal variable condenser tuning the oscillator coil of a superheterodyne receiver (q.v.).

PARALLEL CONNECTION.—The connection of components in a circuit so that they present parallel paths to the current. In a D.C. circuit the proportion of current that will flow through each of the parallel paths will depend upon the individual resistances of those paths. The parallel connection of primary or secondary cells is the joining together of all the terminals of like polarities.

PARAPHASE AMPLIFIER.—A special form of push-pull amplifier (q.v.).

PEAK VALUE.—The maximum value of an alternating voltage or current. The effective voltage of many A.C. mains in Britain is 230, but the peak value will be considerably over 300, so it is often necessary to take peak values into account in the design of components.

PENTAGRID.—*See* HEPTODE.

PENTODE.—This is similar to the screen grid valve (tetrode) but an additional grid is provided to suppress secondary emission of electrons from the anode. This suppressor grid is situated between the screen grid and the anode and is usually connected to the cathode inside the valve. In the absence of a suppressor grid, electrons emitted from the anode as a consequence of the electron stream from the cathode bombarding it tend to collect on the screen grid and this affects the operation of the valve, especially when it is acting as a power amplifier.

PERMEABILITY.—This is the ratio of the magnetic flux to the force which produces it. The practical interpretation of this is that the higher the permeability of the core of an electromagnet the greater will be the magnetic effect for a given current. Or the greater the permeability of the steel, the stronger will be a permanent magnet for a given amount of steel.

PHOTO-ELECTRIC CELL.—A device which translates variations of light intensity into variations of electric voltage or current. There are two main types. In the photo-conductive type there is some substance such as selenium which varies in electrical resistance in accordance with the amount of light that falls on it. The photo-emissive type depends for its operation on the fact that when light falls on some metals, electrons are emitted as they are from the cathode of a valve when heated. The photo-emissive effect has its most spectacular application in the electron camera. *See* TELEVISION.

PICK-UP.—*See* GRAMOPHONE PICK-UP.

PILOT LAMP.—A small electric lamp that gives visual indication that an electric circuit is alive. In a radio set the pilot lamp usually illuminates the tuning dial.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PLATE.—An obsolete name for the anode of a valve.

PLUG-IN COIL.—A coil having pins so that it can be plugged in position in the same kind of way as a valve. Earlier radio sets often used plug-in coils before the technique of switching from one wavelength band to another had been developed.

PLUGS AND SOCKETS.—These are often used instead of switches when the circuit changes require to be made only infrequently. Thus, H.T. and grid bias batteries are provided with sockets into which plugs are inserted in order to make the required connections.

There are sometimes sockets and a plug on a mains transformer in a mains set. When the set is first installed the plug should be inserted in that socket which is indicated as being the one suitable for the voltage of the mains. Loudspeakers are also sometimes fitted with sockets and a plug so that the instrument can be adjusted to match the output of any one of many different kinds of sets.

Plugs often tend to work loose from sockets, even though they are apparently not subjected to any undue vibration. Therefore it is wise at reasonable intervals to check the firmness of plug connections. If they are at these times given quick, firm, to-and-fro twisting movements, there will be a self-cleaning action between the surfaces that will ensure good contacts.

PORTABLE RECEIVER. — A completely self-contained radio receiving installation that can be carried about. Providing that the owner of such a set already has a wireless licence, no additional one is needed even though he also has an ordinary fixed receiver.

A portable receiver does not necessarily have anything in it vitally different from an ordinary battery set, with the exception of a frame aerial (q.v.). Owing to the directional qualities of this type of aerial it is necessary to turn a portable set round so that the frame is in line with the direction of the transmission in order to get the strongest signals. This directional reception may sometimes prove useful in reducing interference. By the way, if an owner of a portable set desires to experiment in the finding of the directions of various transmitting stations, he should note that the bearings are more accurately defined if the position of weakest reception is used. This will be when the frame aerial is at right angles to the direction of the transmission.

It is advisable to remove the batteries from a portable set when it is out of use, otherwise the fumes and creeping moisture from them may cause corrosion of the wires and other metal parts of the set. Such may be caused even by an H.T. or grid bias battery if it is left for very long periods without being inspected.

Accumulator cells used in portables must also be charged regularly as with all other such cells. When a portable is to be out of action for a matter of months, the accumulator should be removed and, if not required for other duties, handed to a charging station to maintain in a charged and efficient condition. Alternatively, after being charged the acid solution can be emptied out and the plates thoroughly washed with distilled water.

POTENTIAL DIFFERENCE.—Difference of electrical pressure. The term is applied to the voltage dropped across any appliance or component in a circuit. When an electric fire is plugged into a D.C. mains power point the potential difference existing across the elements of the fire will be for all practical purposes the voltage of the mains. But supposing two fires are connected in series and then joined to the power point. The current will flow from the power point through each fire in turn. The potential difference, the difference of electrical pressure existing between the terminals of one of the fires will obviously not represent the full mains voltage. In actual fact, it will be a proportion of it depending upon the resistance of the fire and the resistance of the other fire with which it is in series. If the resistances were exactly the same, then the potential difference existing between the terminals of each fire would be half of the total mains voltage.

POTENTIAL DIVIDER.—A resistor with one or more tappings or a sliding contact enabling to be tapped off a proportion of the total potential difference existing across the whole of it. Potential dividers are used for providing grid biasing and H.T. voltages of various values from the one source, and for the adjustment of volume or, in association with variable-mu valves (q.v.), variation of amplifier effectiveness.

POTENTIOMETER.—This term is often incorrectly applied to potential dividers. A potentiometer is a device for measuring potential differences, not for the selection of them.

POWER AMPLIFIER. — Also called power valve. This is the valve that is employed to deliver power to a utilization device such as a loudspeaker. In this valve voltage amplification is not a consideration as in the case of the earlier valves in the set. Its power sensitivity, that is, the power output in watts for a unit volt on the grid, and the power that can be converted without undue distortion becoming apparent, are the important factors.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

POWER PACK.—That part of a mains set which rectifies and distributes the supply from the mains or, as it were, takes the place of the batteries in a battery set. It is given that name because in a conventional commercial set design the components and wiring of the power supply parts of a mains set are often grouped neatly together.

PRE-SELECTION.—The use of selective circuits in a superheterodyne receiver before the frequency is changed in the frequency converter. *See* SUPERHETERODYNE RECEIVER.

PRESS-BUTTON TUNING.—A method of enabling different programmes to be selected by pressing buttons. There are several ways of applying the principle, but in each case there will be a row of push-buttons or small levers labelled with the various stations to which they will automatically tune the set.

The push-buttons may be switches each switching into circuit one or more condensers previously adjusted so as to give the required tuning in conjunction with a tuning coil. Or they may be mechanically coupled with the one variable condenser of the gang type so that each push-button rotates it by a predetermined amount.

In yet another method of push-button tuning, the push-buttons switch on a small electric motor which drives the variable condensers round to an extent depending upon which button is pushed.

To ensure that there shall still be exact tuning, some modern receivers include automatic tuning correction as well. Then, even if the push-button control does not give a precise adjustment the error is automatically rectified.

PRIMARY CELL.—An apparatus that generates electricity by chemical action. The simplest primary cell consists of two pieces of dissimilar metals such as copper and zinc immersed in an acid solution. If the two pieces of metal are connected by a conductor, such as a piece of wire, externally to the solution a current of electricity will flow through it.

Some may find it puzzling that the cell should seem to start its chemical action and produce electricity only when its terminals are joined together through a conductor. But it is to be remembered that there is an electro-chemical action as soon as the solution is put in the cell, or, which is the same thing, the pieces of metal are put in the solution. Differences of electrical pressure between the plates and the solution and between the plates themselves are at once set up. Current flows when the cell is provided with an external circuit and chemical action continues to maintain the differences of electrical pressure.

Many different kinds of primary cells have been invented but today there remains only the one in general use and that is the Leclanché (*q.v.*). A primary cell is not reversible in its action. When it is unable, through exhaustion of its chemical process, to maintain any longer the difference of electrical pressure and supply a current, it can be made useful again only by the renewal of one or more of its component parts.

PUSH-PULL AMPLIFIER. — An amplifier which gives good results because there is a cancelling out of distortion which might otherwise be present. Two valves are so connected that the energy to be amplified is divided between them, the negative half of the alternation going to the grid of one, while the positive goes to the grid of the other, and vice versa. While one is pushing the other is pulling, as it were!

QUIESCENT PUSH-PULL AMPLIFIER.—An economical push-pull arrangement in which anode current flows in the anode circuit of only one of the two valves at a time.

RADAR. — The location of distant objects or surfaces by means of reflected radio waves. Periodic bursts of energy are sent out by the transmitter and, after being reflected, are received as visual indications on the screen of a cathode-ray tube (*q.v.*).

In order to obtain a sharply focused beam the transmissions may be on wavelengths of the order of ten centimetres and even shorter. As the reflected wave represents but a minute proportion of the strength of the transmitted signal, considerable power is required in order to extend the range to a useful extent for navigational and other purposes. Powers exceeding those of large broadcasting stations are sometimes used for radar.

Also a receiver of great sensitivity is required. Owing to the special circuits and components embodied, this is achieved without the background that would otherwise make such high magnifications impracticable.

Special arrangements are also necessary in the transmitter for the handling at great power of the extremely high frequencies. The magnetron is one vital component often used. This is a thermionic valve in which the electron stream is controlled magnetically.

Some of the components may actually be inside the valve itself, and in some systems coupling with these components to other components in the circuit is by radiation from the interior of the valve.

Many of the uses of radar are now well known. It can be used to give the position

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of an aircraft or a ship without the co-operation of either. A ship or an aircraft can determine its own position with amazing precision, a precision far greater than by any other means. Within an area of several hundred square miles, a direct indication of position is possible to within a mere yard or two!

Also, a navigator on a ship can see on a fluorescent screen all the objects, such as ships, icebergs, aeroplanes, land masses and so on, that are present within a wide area round the ship, and their positions relative to the ship. This he can see by radar as clearly in fog or at night as at any other time.

As a kind of contour map moving across a screen, an observer in an aeroplane can

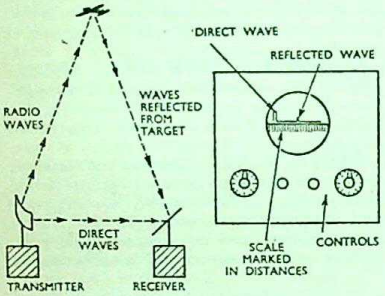


Diagram illustrating the principle of radar. In practice, only the indication due to the reflected wave appears on the screen of the cathode-ray tube shown on the right

see the ground beneath him or the ground ahead despite intervening mist, clouds or darkness.

Searchlights and guns can be laid on to unseen targets with exactitude and the bursts of shells seen with equal clearness.

An interesting radar development is the automatic beacon. When a radar transmission is directed on to it, such a beacon automatically sends back a coded transmission which at once enables its position and the position of the aeroplane or ship initiating the signal to be indicated. This is a development of the system of identifying friend or foe used on British aircraft during the Second World War.

In the more advanced radar systems, where the positions of fixed or moving objects are shown directly on a screen, a rotating aerial is used for transmission. This aerial is highly directional and sends out a focused beam of radio waves which sweeps round like the light from a searchlight. It is not a steady beam but one comprising a series of bursts of energy as though in the case of a searchlight that was being rapidly switched on and off. The bursts might each be only a few millionths of a second in duration.

During the intervals, of an equally short nature, between these bursts, the receiver is active to accept the reflected waves. These intervals are necessary, otherwise the powerful radiation from the transmitter would "swamp" the receiver.

The receiver employs a cathode-ray tube in which the electron stream is made to sweep round the fluorescent screen in exact synchronism with the rotating aerial of the transmitter.

Thus the reflected energy that comes back when the transmitter is, for example, focusing its energy dead north, modulates the electron beam of the cathode-ray tube when it is on a line corresponding to a dead north line on the fluorescent screen. The distance of the reflecting object will determine its position along that line on the screen. Therefore, modulation of the light intensity on the screen will occur at a point on it corresponding to the position of the object in the area of land, sea or sky represented by the screen.

This brightening or darkening of a particular spot on the screen is not an instantaneous effect. There is a delay in the reversion to normal after the electron beam has moved on. This delay is, in fact, long enough for the electron stream (which is, as we have said, in synchronism with the rotating transmitting aerial) to cover the whole screen.

In this manner a complete picture of the area is built up. An aircraft observer can see through the darkest clouds the outlines of buildings many miles ahead, he can see rivers and canals and the vessels on them. An observer on a ship is able to see even at night the outlines of a coast with lighthouses and other objects clearly defined. That is, clearly defined to the trained observer. The uninitiated might find almost as much cause for wonder in the way dark blobs and light smears are immediately and infallibly identified as in the miracle of radar itself.

RADIO FREQUENCY.—The frequency of any electro-magnetic radiation used for communication purposes. The current generated in a receiving aerial by radio waves will have a radio frequency. In other words a radio frequency is an electrical vibration of a tremendously rapid nature. The alternating current that comes from your mains to light electric lamps, actuate cookers and perform other such services, changes its direction of flow fifty times a second. This is a low or audio frequency; translated into air vibrations it would be heard as sound. The current in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a radio aerial will be changing its direction, flowing first one way and then another, as many as a million times a second and more; that is a radio frequency or, as it is sometimes called, high frequency.

RADIO-FREQUENCY AMPLIFICATION.—The amplification of alternating electrical voltages having a high frequency. *See* HIGH FREQUENCY AMPLIFICATION.

RADIO-GRAMOPHONE.—A radio receiver that is fitted with a gramophone turntable and can also be operated as an electric gramophone. Instead of the sound-box of the mechanical gramophone, it is fitted with a pick-up that translates the vibrations of the needle into varying electrical currents. These are conveyed to the audio-frequency amplifying part of the radio receiver, which amplifies them in just the same way as it amplifies broadcast speech and music, the one loudspeaker serving for both purposes.

Battery radio-gramophones have clockwork turntable motors, as the driving of an electric motor of sufficient power would impose a considerable drain on a small accumulator such as is usually employed in a battery set. Mains-actuated radio-gramophones have electrically driven turntables.

The more ambitious radio-gramophones are also equipped with automatic record changers so that a selection of gramophone records can be played through without the instrument needing any attention at all.

A practical point to watch for when buying a radio-gramophone is to see that its lid can be shut right down while a record is being played. If the lid cannot be shut, sound will be heard direct from the pick-up, a thin, tinny, unpleasant sound.

RADIOLOCATION.—*See* RADAR.

RASTER.—The pattern of lines of light on the screen of the cathode-ray tube in a television set from which, by variations in intensity, the picture is built up.

RATING. — The specified output or capacity of electrical apparatus.

REACTION.—The feeding back of some of the energy from the anode circuit of a valve to the grid circuit so as to build up greater amplification. There is a point beyond which this feeding back cannot be taken without a state of oscillation occurring.

In the first reaction arrangements, a coil in the anode circuit (the reaction coil) was brought nearer to or taken farther away from the grid circuit tuning coil in accordance with the amount of reaction required. Later, condenser-controlled reaction was introduced and became more or less standardized.

All those listeners who still have sets with reaction controls should remember that a careless use of reaction may cause radiations to be transmitted from the aerial that will interfere over a wide area with reception by other listeners.

RECEIVER.—The essential purpose of a radio receiver is to transform the minute electrical currents in a radio aerial into currents suitable for the operation of telephone receivers or loudspeaker. The simplest type of receiver is the crystal set (q.v.). All this does is to take these feeble aerial currents and pass them on to telephone receivers in the necessary rectified form.

A crystal set adds no power to the received energy, so that only when it is very close to a broadcasting station will it operate a loudspeaker and then only extremely feebly. Valves are necessary to provide the amplification necessary for good loudspeaker reproduction and for the reception of stations other than a nearby local one.

The features which decide the quality of a valve receiver are as follows:—

Selectivity.—Unless its selectivity is of at least a fair order, it is impossible to tune in stations, especially at night, without there being an interfering overlap from other stations.

Sensitivity.—For the satisfactory reception of distant stations, a set must be able to provide a fair measure of sensitivity.

Response.—A good high-note response, so that the sibilants of speech and the tonal characteristics of stringed instruments are heard clearly, and an ample, clear bass response must both be present before the reproduction can be classed as good.

Ease of Control.—This implies clearly calibrated, easy-to-read tuning dials which can be quickly and surely operated, and accessible, easy-to-handle subsidiary controls such as those for waveband changing, volume adjustment, etc.

Stability and Freedom from Noise.—There should be no excessive hum or other interference under normal reception conditions, and no tendency to break into squeals and howls or shift away from its tuning once it has been adjusted for any particular station.

There is a tendency to regard the number of valves in a radio receiver as providing an indication as to its performance. At one time, and particularly when there was, broadly speaking, only the one kind of valve set and only one kind of valve, the number of valves did mean something. But in these days of multiple valves it means very little unless the type of circuit used in the set is also specified.

There are two main types of circuit, these being the superheterodyne (q.v.) and the straight or tuned radio-frequency.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The latter is, as one of its names suggests, a straightforward arrangement of valve detector and amplifying valves. There will probably be one or two valves for amplifying the energy in the form it is induced in the aerial. Then, after this amplified radio-frequency energy is demodulated by the detector valve, there will be further amplification by one or two audio-frequency amplifying valves so as to build up sufficient strength for loud-speaker operation.

In brief, a straight set has tuning for selecting the programme required, R.F. amplification of the received energy to provide selectivity and sensitivity and, after the detector, A.F. amplification to build up volume.

The superheterodyne receiver (q.v.) also has tuning for programme selection and R.F. amplifiers, but instead of the apparatus being tuned to the frequency of the transmitting station at every stage in it where R.F. energy is handled, there is a frequency converter that converts the energy due to any transmitter into the one same frequency.

Both straight and superhet sets can be either battery or mains operated. Where normal mains supplies are available a mains set should be used, not only because of the obvious reason that it has no batteries needing maintenance and periodic charging and replacement but also because, as a general rule, the performance of mains valves is somewhat better than that of battery ones.

An all-wave receiver is not a receiver which, as the term might seem to imply, will receive wireless transmissions of all wavelengths. It is one that is able to tune in not only the medium and long waves but also some of the short waves as well. The short-wave coverage of the average commercial set is not by any means complete and some are somewhat restricted in this respect. However, it can be at least said that a good all-wave receiver does provide a wide range of wavelength selections enabling a large number of stations to be heard.

There are numerous radio receiver refinements and many of them are described under separate headings such as AUTOMATIC GAIN CONTROL, PRESS-BUTTON TUNING, etc. A useful adjunct to tuning is a tuning indicator which gives visual indication when a receiver is tuned in correctly to a station. Then there is automatic frequency control (sometimes referred to as automatic tuning correction). This operates in such a way that so long as a station is roughly tuned in, the receiver itself can apply the final adjustment to bring it to a point of exact tuning.

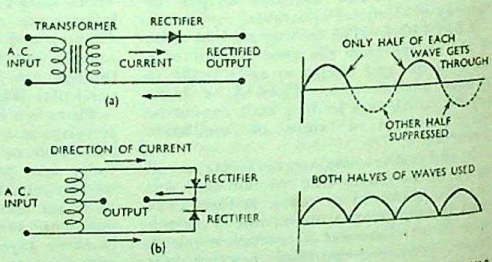
The need for precise tuning is very real with most modern sets of high selectivity. The slightest deviation from it may introduce distortion that is not always noticeable in any one particular passage of music or during some periods of speech.

The less expensive mains receivers do not always have quite as much smoothing in them as they should, and therefore the hum level is rather high. On the other hand, there are not now so many arguments in favour of expensive, individually made receivers. First-class receivers having excellent performances can be turned out by modern mass-production methods.

RECTIFICATION. — To change an alternating current, such as is supplied by many of the mains systems, into the direct current necessary for the anode circuits of valves, there must be rectification. It is essentially a simple process and consists merely of using some device (a rectifier) that allows the current to pass in the one direction only.

Of the various types of mains rectifiers, two only are used in radio sets, valve and metal rectifiers (*See* VALVE, METAL RECTIFIER). The simplest rectifying circuit uses one rectifier and merely suppresses the alternating current when it is flowing in the one direction and allows it to pass freely in the other direction. This is known as half-wave rectification. But it is not often used owing to the fact that the resulting unidirectional current is not easily smoothed.

A transformer with a centre tap connected to two rectifiers can be employed so as to obtain full-wave rectification, both half



In half-wave rectification (a), *the rectifier suppresses one half of each cycle. By using two rectifiers and a centre-tapped transformer* (b), *both halves of each cycle can be made to flow in the one direction*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cycles of the alternating current emerging in the output as current flowing the one way. Or a normal transformer and four rectifiers will also provide full-wave rectification. Yet another method uses an ordinary transformer, two rectifiers and two condensers to provide full-wave rectification and a D.C. output voltage about twice as great as the voltage across the secondary winding of the transformer. This is particularly suitable for the high voltages, but comparatively low currents, required as H.T. for radio sets. There is the further advantage that the condensers have a partial smoothing effect.

REDIFFUSION.—Another term for the relaying of wireless programmes from a central receiver over wires to listeners.

REFLEX CIRCUIT.—*See* DUAL AMPLIFICATION.

REGENERATION.—*See* REACTION.

REMOTE CONTROL.—The control of electrical apparatus at a distance. There have been many systems of radio set remote control, some highly ingenious, but none as yet appears to have achieved any widespread popularity. The simplest form of remote control comprises a relay which enables a set to be switched on and off from some distant point such as another room in a house. A more complicated system provides in addition remotely controlled tuning which permits the set to be tuned to different stations at the distant point or points.

RE-RADIATION.—The radiation from a receiving aerial that occurs when a set having reaction is being mishandled. The term is also applied to the radiation of high-frequency interference from mains wires.

RESISTANCE.—The property of a conductor by virtue of which it tends to resist a flow of electricity. The unit of resistance is the ohm. The resistance of a length of wire of any particular metal is directly proportional to its length and inversely proportional to its cross-sectional area. Double the length, and the resistance is doubled; double its cross-sectional area, and its resistance is halved.

RESISTANCE-CAPACITANCE COUPLING.—The use of a resistance and a condenser to couple the anode circuit of one valve to the grid circuit of another valve. The resistance provides a path for the steady anode current and at the same time a load across which the alternating current variations appear. The condenser provides a path for the alternating currents to the grid of the next valve, but acts as a barrier to the steady current.

RESISTOR.—A component specifically designed to add resistance to a circuit.

RESONANCE. — The condition of a circuit when large alternating currents and voltages are built up by small EMFs. It occurs at the natural frequency of the circuit. Something of an analogy would be a bridge that vibrated at a natural frequency equal to the frequency of the steps of a number of soldiers marching across it. Although the energy represented by the soldiers marching would remain substantially constant, the bridge would vibrate more and more violently until it broke to pieces. That is why soldiers are ordered to break step across some bridges.

The reason why in a resonant electrical circuit the stimulus of an applied EMF at the same frequency does not cause more than a certain amount of build-up is due to the losses occasioned in all circuits through resistance.

RETROACTION.—*See* REACTION.

SATURATION.—There are two kinds of saturation encountered in radio. The one is magnetic saturation. This occurs when more than a certain amount of steady current passes through the primary winding of an iron-cored transformer. Further increases of current beyond this point do not produce a corresponding increase in the magnetic intensity.

Then there is saturation as applied to a valve. This is a condition of maximum anode current for a given H.T. voltage. Practically all the electrons that stream off the cathode are getting to the anode and any increases of positive potential on the grid make comparatively little or no difference to the anode current.

SCANNING.—The process of tracing a television picture line by line. *See* TELEVISION.

SCREEN.—A fine wire mesh inserted between two other electrodes in a valve in order to reduce the capacitance between them. Also called screening grid or screen grid. A screen in television is the end of the cathode-ray tube that is covered with a fluorescent material and on which the pictures appear.

SCREEN-GRID VALVE. — A four-electrode valve that is in effect a triode having a screen grid inserted between its control grid and anode. A three-electrode valve cannot efficiently be used in radio-frequency amplifying circuits because of the capacitance that exists between its grid and anode. These two electrodes act as a small condenser and would provide coupling between the anode and grid circuits. Through this coupling, energy would be fed back from the anode circuit to the grid circuit for further amplification and a vicious circle develop with consequent loss of stability. Special stabilizing arrangements had to be employed before the invention of the screen-grid valve.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This screen grid, which is interposed between the control grid and the anode of the valve, is given a high potential so that it does not oppose the electron stream from the cathode. At the same time, however, it acts as an electro-static screen. A screen-grid valve can provide great amplification. *See* VALVE.

SECONDARY EMISSION. — The emission of electrons from a surface that is being bombarded by an electron stream. The anode of a valve emits electrons in this way and, in the pentode, an additional grid is provided to supress the emission. *See* PENTODE.

SECONDARY WINDING.—The winding on the output side of a transformer. If it has more turns than the primary, there will be a step up in voltage; if the secondary has fewer turns than the primary winding, there will be a step down in voltage.

SECOND DETECTOR.—The second of the two detectors in a superheterodyne receiver. The first one is associated with the oscillator in the frequency converter, and the second one acts in the same way as a dectector in a straight set and is often described as a demodulator.

SELECTIVITY.—The ability of a part or the whole of a radio set to discriminate between wanted and unwanted frequencies. As the frequency of a broadcast transmission is really a narrow band of frequencies (*see* SIDEBAND), extreme selectivity is liable to cause a loss in high notes. On the other hand, a set having poor selectivity will not tune in distant stations free from interference, although the quality of the response may be superior. Some sets are fitted with a variable selectivity control which can be adjusted to suit prevailing conditions.

SENDER.—A recommended alternative to transmitter.

SENSITIVITY.—The sensitivity of a set is determined by the weakness of a wireless wave to which it will usefully respond. It is measured by noting how little radio-frequency input there need be from a testing device in order to produce a standard output from the set.

Theoretically there is no limit to the sensitivity that can be achieved by adding more and more valves to provide more and more amplification. But there is a practical limit and that is when noises made by the set reach a certain level because of the amplification process. The random motions of electrons in conductors and unevenness of electron movement in the electron stream from a valve cathode are the two causes of noise that put a practical limit on amplification.

SERIES CONNECTION.—Two or more pieces of apparatus are in series when they are so connected in a circuit that the current passes through each in succession. The cells of a battery are in series when they are linked in a chain, the positive terminal of one being joined to the negative terminal of the next cell in the chain and so on.

SET NOISE.—Noise due to the set itself. *See* SENSITIVITY.

SHIELDING.—If it were not for the metallic shielding employed in a modern radio set, neither the compactness of construction nor the amplification achieved would be possible. Shielding is given to coils, condensers and even valves, in the form of complete metal boxes, and shielding to conductors by braided metal coverings, in order to confine the electrical influences of those things to their own spheres and to their correct purposes. Shielding is often provided for complete sections of sets to isolate them from other sections.

SHORT WAVES. — These are radio waves under about fifty metres in length. Communication by short waves is possible with relatively low power because they are reflected effectively by the ionized layers in the upper atmosphere.

Radio waves are radiated from the aerial of a transmitter in all directions. Those which tend to cling to the earth as they travel diminish fairly rapidly in strength. Others go straight off into space and, in the case of short waves, many are reflected strongly back to earth where they can be received at great distances from their source.

Areas occur where the ground waves have died away and which are too near the transmitter for the reflected waves to begin. This "skip distance" effect explains the

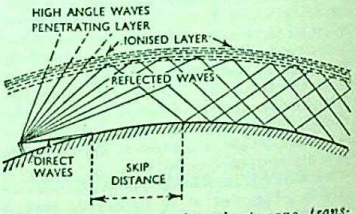


Diagram showing why short-wave transmissions can be received at far-distant places, and yet not at some intermediate points. This is called "skip distance" effect

reason why listeners in far countries can receive British short-wave programmes better than many in Britain itself.

Short-wave receiving apparatus is essentially similar to apparatus for receiving on medium and long wavelengths except that greater attention is necessary to its

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

design in regard to the reduction of unwanted capacitance and inductance in components and wiring, for these cause losses and are also liable to affect the tuning of circuits.

The tuning adjustments of short-wave sets are critical, and slow-motion mechanisms are advisable. Even so, delicate handling is generally necessary.

From the listener's point of view, a receiver that can tune in short-wave programmes has the attraction that it enables distant broadcast programmes, such as those sent out from the United States, to be heard. Reception conditions are, however, liable to vary considerably. Also atmospherics and other forms of interference are often more severe than on the higher wavelengths.

Nevertheless, a good short-wave set or a set of the all-wave type (which means one that covers the short as well as the usual medium and long waves) can almost always provide numerous short-wave programmes at good strength and with good quality. For when reception is poor on one part of the short-wave band, it is often good on others. And many of the short-wave programmes from various countries are sent out simultaneously on several different short waves for this reason.

SHUNT. — Two pieces of electrical apparatus are in shunt when the same EMF is applied to both.

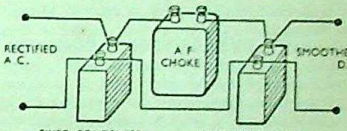
SIDEBAND. — When a broadcasting station is said to be transmitting on a frequency of, say, 1,000 kilocycles, that does not tell the whole story. It will certainly be vibrating the ether at the frequency of 1,000,000 cycles per second, for that is what 1,000 kilocycles represents. But, in addition, it will be causing a small family of other frequencies, and these will represent the modulation (the speech and music accompanying the transmission). The 1,000,000-cycle frequency is only the fundamental frequency of the transmission. If a middle C note is being played on the piano, there will also be frequencies of 1,000,256 and 999,744 going out into space for listeners to tune to at the same time as they tune to the fundamental frequency of the transmission. These new frequencies are that of the fundamental, plus and minus the frequency of the middle C piano note, which is 256 cycles per second.

There will be other frequencies which will be plus and minus that 1,000,000 fundamental frequency to the extent of the frequencies of the overtones of the middle C piano note. Every different note from every different musical instrument that is causing the transmission to be modulated will produce a family of these additional frequencies which form a band of frequencies stretching out on either side of the main frequency. Now the definition of sideband should be clear. It should also now be easy to see why selectivity affects quality. A set that is over-selective will cause the sidebands of transmissions to be cut off.

SINGLE-POLE SWITCH.—A switch that makes and breaks on only the one pole. Switches used in domestic lighting are usually single-pole switches; they break and make the circuit by making and breaking only one of the wires running from the mains to the light.

SMOOTHING CIRCUIT. — A filter circuit for smoothing out the ripple in rectified mains current so that the hum it causes is reduced. It comprises an arrangement of chokes and condensers. The chokes are coils wound on iron cores which offer very little opposition to a flow of steady current but a great deal of opposition to any variations in the current.

Smoothing is to a large extent an economic consideration. Efficient smoothing demands the use of a plurality of chokes and condensers of high value. Many sets produced for the competitive market hum



Illustrated here is a simple smoothing circuit embodying an audio-frequency choke and two fixed condensers

quite noticeably while they are working because a certain amount of hum has been tolerated in keeping the cost of manufacture as low as possible. A proportion of the hum may be due to the fact that there is a crowding of components in order to achieve compactness, without the efficient shielding needed to restrict their varying magnetic fields. This is also an economy consideration. It should be known to all listeners who intend buying mains sets that hum is not always and entirely a necessary evil.

SOFT VALVE.—A valve in which there is more than a certain amount of gas. A very soft valve ionizes easily and breaks into a blue glow when only moderately high voltages are imposed on it.

SPECIFIC GRAVITY.—For practical purposes, this can be thought of as the density of a substance as compared with that of water.

SPEECH COIL.—The coil of a moving-coil loudspeaker through which are passed the variations of electrical current

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

representing the speech and music. *See* LOUDSPEAKER.

SQUARE LAW CONDENSER. — A variable condenser with its plates so shaped that the capacitances to which it is adjusted are proportional to the square of the readings on its dial. The effect of this is that when it is used for tuning, the wavelengths it covers are spread equally round the dial instead of being spread out over one part and crowded together at another.

STAGE.—All the components and connections associated with a valve. For example, if there are two radio-frequency amplifying valves in a set, there will be two R.F. stages.

STRAIGHT LINE FREQUENCY CONDENSER.—A variable condenser so designed that when it is used for tuning, equal movements of its dial will give equal alterations of frequency.

STRAIGHT RECEIVER. — *See* RECEIVER.

SULPHATION.—The formation of lead sulphate, an insoluble, whitish substance, on the plates of an accumulator. This occurs when an accumulator is allowed to stand for long periods in an undischarged condition. A bad attack of sulphation may ruin an accumulator, for it cannot always be cured.

SUPERHETERODYNE RECEIVER. —This term is an abbreviation of supersonic heterodyne receiver, and it is often still further abbreviated to superhet.

The principle of the superheterodyne method of reception is quite simple, although the apparatus with which it is applied may be complicated by various refinements.

First of all we must remind ourselves about the ordinary method of reception. Out of the numerous programmes coming through space, we select just the one and tune the input circuit of our ordinary radio receiver so that it responds to this one particular frequency; it might be, for example, a B.B.C. transmitter which vibrates the ether at a frequency of 1,000,000 cycles per second or thereabouts.

In order to increase the strength of the feeble radio-frequency current, a stage of radio-frequency amplification is provided. This also requires tuning to the frequency of the transmission we have selected. And there will be more tuning if there is yet a further stage of R.F. amplification before the energy is detected.

All this tuning is a mixed blessing. It is an advantage in that the more tuning circuits there are in a set the greater the selectivity, but it is a disadvantage owing to the plurality of tuning controls it introduces. True, these controls can be ganged, i.e. mechanically coupled, but ganging cannot give perfect tuning in such a case.

The superheterodyne receiver changes the frequencies of all the radio-frequency currents to which its input is at various times tuned; it changes them to the one uniform frequency. And it does it in this manner.

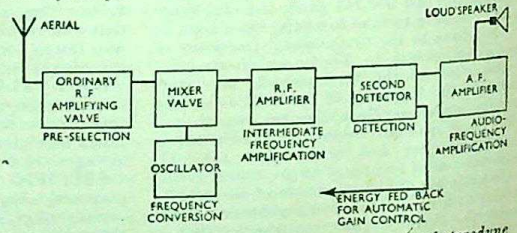
It has an oscillator valve which generates a radio frequency just as does the oscillator valve of a transmitting outfit. And it combines this frequency with that of the received energy. As a result, a beat frequency is produced.

The set is so designed that the frequency generated by the oscillator preserves the same difference in relation to any one of the transmitters to which the set is tuned. Supposing the station has a frequency of 1,000,000 cycles per second, then the average superheterodyne will provide an R.F. current of 1,450,000 cycles to combine with it. The result is a beat or difference frequency of 1,450,000 minus 1,000,000 equals 450,000 cycles per second, or 450 kcs (kc = kilocycle).

If a station having a frequency of, say, 1,250,000 is tuned in, the oscillator provides a frequency of 1,700,000, so that the same beat frequency as before, 450 kcs, is produced.

In short, the tuning of the oscillator is so coupled to that of the main tuning circuits that it always provides for the same beat frequency. Actually there are two beat frequencies in each case, representing the sum and the difference of the individual frequencies, but only the one is used and the other allowed to go to waste.

Well, then, we have the same beat frequency resulting, whatever the station tuned in. The part of the set which does this is known as the frequency converter for, in effect, it converts all the stations to the same frequency. The oscillator is



Illustrating the processes which occur in a superheterodyne receiver. The A.G.C. adjusts the sensitivity so as to maintain a uniform volume from the loudspeaker, despite fading

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

usually a triode and the oscillating current it produces is fed into a pentode or hexode, where it is mixed with the other frequency to produce the beat. In modern sets, these two valves are generally combined in the one multiple valve; thus, the triode-pentode, triode-hexode and the heptode (q.v.).

From that point on in the set there is no need for variably tuned radio-frequency circuits. All the stations are transformed to the same intermediate frequency.

So the subsequent R.F. amplification can consist of several stages, each designed to be at its optimum effectiveness at that one R.F. frequency. And even the short-wave stations are converted to this one frequency in the all-wave superheterodyne receiver and given the same degree of effective amplification.

Great efficiency with simple tuning controls and relatively simple apparatus is, therefore, possible, together with excellent selectivity and a high degree of sensitivity.

After amplification, the radio-frequency currents are detected by a detector valve in the usual way. It is called the second detector because the mixer part of the frequency converter is known as the first detector.

To provide for even greater selectivity, there can be ordinary R.F. amplification before the frequency converter stage is reached, and this is known as pre-selection.

SUPPRESSOR GRID.—*See* PENTODE.

SWITCH. — A device for making and breaking an electric circuit, or for altering circuit connections. Many different types of switch are used in radio sets, from simple single-pole ones to three- and four-pole multi-way ones. Sometimes switches are combined with other components. For instance, many sets have switches combined with variable resistances so that a set can be switched on and off and the volume adjusted all by the one rotating knob.

Switches are often a cause of noise. Briskly operating one several times may stop the trouble if it is due to a faulty contact between its elements.

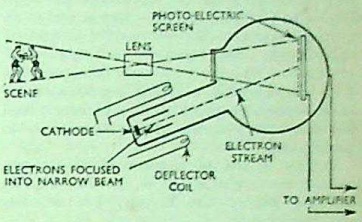
TELEVISION. — Modern television transmissions are on ultra-short waves of under ten metres. The reason for this is that the sidebands (q.v.) of a television transmission cover such a wide frequency band each side of the carrier wave that they would swamp all the medium-wave stations.

The highest transmitted frequency of speech or music is not much above 10,000 cycles per second. That is also about the highest frequency of vibration to which the average loudspeaker will respond.

The vibrations representing a picture broken up into small components for television range up to some two millions or so cycles per second. So with television we actually start in the studio with a frequency higher than that of the carrier wave (q.v.) of many ordinary broadcasting stations.

Two receivers are needed for television, though normally they are built as one instrument. One is a sound receiver, fitted with a loudspeaker, and the other a vision receiver provided with a screen.

At the transmitter, an electron camera is used to traverse the scene and this transforms it into a continuous series of electric current variations. It works in this



How the television camera transforms light patterns into variations of current

manner. The device is similar in many respects to a cathode-ray tube. There is a cathode from which electrons are emitted and these are focused into a narrow beam which is directed at a screen on the end of the tube.

By means of a special circuit arrangement, this beam is made to swing across the screen in straight lines. Each time it completes a line it moves a trifle so that the whole screen is covered in a succession of these traversing movements. At the end of the complete operation the beam is swung right back to start all over again. It does this at the rate of twenty-five per second.

The screen is a mass of tiny particles of a special chemical, each acting as a photo-electric cell. The scene to be televised is focused on to the screen and each tiny particle is electrically affected according to the intensity of light on it. As it sweeps by, the scanning electron beam causes the electrical effect to be communicated to the external circuit.

So twenty-five successive glimpses of the scene, as it were, can be dealt with by the transmitting apparatus as one current varying in strength.

A television receiver employs a cathode-ray tube (q.v.) in which an electron stream is focused on to a fluorescent screen, in exact synchronism with the scanning

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

electron stream in the electron camera used at the transmitting station.

The synchronizing is automatic and is done by impulses sent out by the transmitter which are combined with the electrical vibrations representing the picture.

Many time-base circuits have been developed for cathode-ray tube scanning, but they all embody more or less the same basic principles. The electron beam is deflected in a straight line across the screen by a voltage which builds up and up and then disappears suddenly so that the beam shoots back to its starting point. At the same time it is being gradually deflected in small amounts in the direction at right angles to the line. In this way a rectangle of the screen is covered and the picture reproduced. The strength of the electron stream is varying all the time in accordance with the amount of light represented by each successive point in the picture. And the fluorescent screen glows accordingly at each point.

Owing to the persistence of vision, the viewer sees, not a series of lines rapidly chasing across the screen, but a clear moving picture.

TETRODE.—A four-electrode valve.

THERMAL DELAY SWITCH.—A type of automatically operating switch which operates after a current has been flowing through it for a predetermined time. In some radio apparatus it is not considered advisable for the H.T. to be applied to the anodes of the valves until their heaters have reached their normal operating temperatures. A thermal delay switch is used to ensure an appropriate delay in the switching in of the H.T.

TIGHT COUPLING.—A maximum of magnetic linkage between two circuits.

TIME BASE.—*See* TELEVISION.

TONE CONTROL. — The commonest type of tone control makes the reproduction more or less mellow by cutting off more or less of the high notes. A better arrangement is a control which varies the overall fidelity of the set by narrowing or widening its radio-frequency response (*see* SELECTIVITY.) Yet a third type is the acoustically compensated tone control which enables the high, middle and low tones to be maintained evenly as the volume is reduced. Normally, the high and low tones diminish much more than the middle ones with reduction of volume.

TRANSFORMER. — Apparatus for changing one electrical voltage to another.

TRANSMITTER.—Valves are used in a broadcasting transmitter just as they are in a receiver, but they are considerably larger valves as, of course, they have to handle much greater powers. Some of the valves in a big transmitter are water-cooled.

The key valve is the oscillator; this generates the radio-frequency currents. In a large installation there may be three or more valves in the oscillator unit and a special crystal device which fixes the frequency exactly and prevents any variations. This crystal control is a most important item, for it is very necessary that broadcasting stations should keep exactly to their wavelengths and not wander off them. Any deviations might result in overlapping and interference with other stations.

The modulator of a transmitter is something like the mixer in a superheterodyne receiver; it mixes frequencies. There on the one side are the radio-frequency electrical vibrations generated by the oscillator and there, on the other, are the electrical vibrations of speech and music that have come over a line from the studio control room. All these are "mixed" and there emerge radio-frequency electrical vibrations which swing up and down in strength at the speech and music frequencies.

In technical language, we now have a modulated carrier.

This is then amplified in huge radio-frequency amplifiers and, in its greatly amplified form, it is made to vibrate the aerial system electrically. And off into space speed the wireless waves.

TRIMMER. — Also called trimming condenser, this is a small adjustable condenser used in connection with ganged variable condensers to apply correction, when required, to one of its sections.

TRIODE. — A three-electrode valve. *See* VALVE.

TRIODE-HEXODE.—A multiple valve comprising a triode and a hexode in the one bulb.

TRIODE-PENTODE.—Combination of triode and pentode in the one bulb.

TUNED ANODE CIRCUIT. — A circuit comprising a coil and condenser in parallel, both being in series with the anode of a valve for coupling it to the grid of another valve in a radio-frequency amplifying arrangement.

TUNED CIRCUIT.—A circuit usually containing a coil and a variable condenser permitting it, within moderately wide limits, to be tuned to any frequency desired.

TUNING.—The adjustment of a tuned circuit so as to select one frequency or band of frequencies to the exclusion of others. In tuning a wireless set, it should be remembered that there is usually only the one well-defined point on any tuning dial where a particular station can be said to be properly tuned in.

Any departure, even a minute one, from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

this point may introduce some distortion. Varying the tuning should never be adopted as a means of controlling the volume. On some sets, particularly short-wave ones, the tuning is extremely critical in the sense that it is difficult to find the stations and difficult exactly to tune them in.

The control must be operated slowly and steadily through the whole set of readings among which it is thought the desired station is to be found. If the control is turned quickly, you may sweep past the point of tune without the station being heard at all.

When the station is heard, the control should be turned a trifle first the one way and then the other, overshooting slightly the tuning in each direction. By narrowing down this overshooting it is possible quickly to determine the dead central point that represents exact tuning. On some sets there are tuning indicators to provide visual indication of correct tuning.

If there are two tuning controls, the one that has the less critical control should first be set roughly where the required station is expected to be heard and then the other control operated carefully as above. Then the first control can be closely adjusted. To search for stations with two dials, the one should be advanced a little from its zero position and then the other explored over a few readings. Then the first one should be advanced a little farther and the second explored again.

If the set has an adjustable reaction control, this should be handled carefully when tuning or serious interference might be caused with the sets of all nearby listeners.

TUNING CONDENSER. — A variable condenser used for tuning. It consists of two sets of plates (sometimes called vanes), the one fixed and the other movable. The more the movable ones are made to interleave with the fixed ones, the greater the capacitance and the higher the wavelength of the circuit being tuned.

TUNING CONTROL. — In a modern receiving set there is usually only the one tuning control and this may be calibrated with wavelengths or even with the names of stations. But as the wavelengths of broadcasting stations are sometimes changed, the station name dial may not always continue to be a reliable guide. There are many sets in use having station name dials that are hopelessly out of date. On the other hand, in normal times, wavelength changes among broadcasting stations are not frequent or extensive and seldom affect materially many of them at any one time.

Tuning controls are generally calibrated in wavelengths and frequencies in addition to station names. Or there may be only the two sets of figures. These are alternative labels. You can identify any station by either its frequency or its wavelength, and if you know the one you can work out the other. *See* WAVELENGTH.

TWEETER. — A loudspeaker deliberately designed to be high-pitched. That is, to emphasize the high notes and give practically no response to the low ones. It is used in conjunction with another loudspeaker so as to improve the combined response to the higher notes.

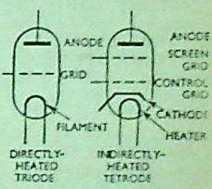
TWO-ELECTRODE VALVE.—A valve having only a cathode and an anode. It can be used only for rectification. Sir Ambrose Fleming's original valve invention. It was not until Dr. Lee de Forest invented the grid, and thus produced a three-electrode valve, that amplification was possible.

ULTRA - SHORT WAVES. — Radio waves having wavelengths of less than ten metres. They are used for television and radar and also for portable transmitting and receiving arrangements.

As a general rule, ultra-short waves have an optical range. That is to say, they do not follow the curvature of the earth and are receivable only at points which, on a clear night, could be connected by light signals. That is why television broadcasts are restricted in range.

VALVE.—Over sixty years ago, Edison discovered that if a metal plate were placed inside an electric lamp an electric current would pass to it from the filament. This was the key discovery that made modern radio possible.

The "Edison effect" is easy to explain in the light of present-day knowledge. It is that it depends on the fact that when the temperature of metal is raised beyond a certain point, minute particles (electrons) are boiled off its surface. These particles are smaller than atoms; indeed, they are parts of atoms.



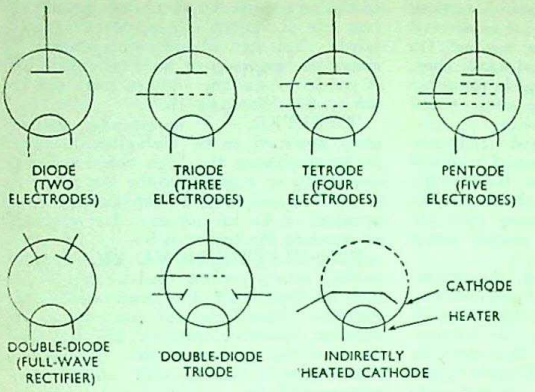
Showing the disposition of the electrodes in a three-electrode valve. In the case of the individually heated type on the right, the cathode is raised in temperature by a heater as indicated

In an electric lamp they merely form an invisible cloud round the filament which, when it becomes dense, opposes further boiling off of particles.

Inserting a plate of metal in the bulb provides something for the electrons to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Symbols of some of the simple types of directly heated valve. Indirectly heated valves have a heater through which the L.T. (heating current) flows, as is shown in the final symbol

rush to, for the metal plate will be deficient of electrons as compared with the hot filament. But if nothing else were added, in due course there would be a state of equilibrium with the plate having its electron deficiency made good and the electron flow to it would cease.

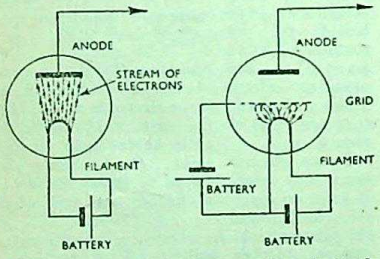
A battery provides a current through an electrical circuit because, by chemical means, it sets up an electron deficiency on one of its elements as compared with the other.

Join a battery across the plate and filament of the special lamp and this difference of electron balance obviously results in the stream of electrons being maintained. In other words, an electrical current passes from the battery through the lamp.

But it is a one-way effect. Current cannot be made to pass in the other direction. Therefore, applying an alternating current to the two-electrode valve—for that is what it is—results in that current being allowed to flow in one direction only. In technical parlance, it has been rectified.

Reverting to the battery and two-electrode valve arrangement, it was later discovered that a mesh or spiral of wire (grid) inserted between the filament (cathode) and plate (anode) could be made to influence the electron stream. Comparatively small voltages on this grid from some independent source affected the electron stream as much as quite large alterations in the voltage of the battery.

Thus the valve became an amplifier of weak electrical effects of the nature of those due to the action of wireless waves on receiving aerials.



When a grid is made negative, it tends to repel electrons emitted from the filament

A valve amplifier having a filament, grid and anode is a triode, a three-electrode valve.

Subsequently a second grid was placed between the first grid and the anode to act as a screen between them so that they would not act as a small electric condenser and provide an unwanted circuit coupling. We now have the screen-grid valve, or tetrode.

A complication had been noticed in all these earlier valves. The bombarding of the anode by the electron stream caused electrons to be torn off the anode in the form of a secondary electron emission. To suppress this, there was added yet a third grid placed between the screen grid and anode and joined, usually inside the valve, to the cathode. This five-electrode valve having a supressor grid is known as a pentode.

Practically all other radio valves are developments of these basic types. *See* DIODE, DOUBLE-DIODE PENTODE, HEPTODE, HEXODE, INDIRECTLY-HEATED VALVE, etc.

VALVE HOLDER.—The socket in a set into which a valve is plugged.

VARIABLE CONDENSER.—*See* TUNING CONDENSER.

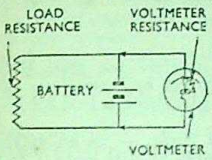
VARIABLE-MU VALVE.—This is a valve, usually of the screen-grid or pentode type, having amplification effectiveness that can be varied by varying its grid bias. In other words, it can be made to act as either an extremely good or very poor radio-frequency amplifier or anywhere between the two extremes. This is done by applying different voltages to its control grid. It is a type of valve widely used in connection with automatic gain control (q.v.).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

VOLTAGE.—An electrical pressure or difference of pressure stated in volts.

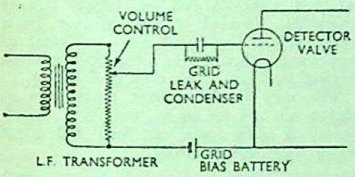
VOLTMETER. — An instrument for measuring electrical pressures. It is always connected across the two points between which it is desired to take the measurement and therefore provides a parallel path for the current. So it is necessary for the voltmeter to have a high resistance, otherwise it will divert current, influence circuit conditions, and may give misleading readings.



A resistance is usually included in the construction of a voltmeter so that the total resistance of the instrument should be high and, therefore, will not materially affect the circuit conditions

VOLUME CONTROL.—A manually-operated volume control is necessary on all sets whether or not they are fitted with automatic gain control (q.v.), so that the volume can be adjusted to any desired level. It is then the job of the automatic gain control to maintain that level despite any fading that may occur.

There are many methods of controlling volume, but those are to be preferred that do not in any way affect the quality by



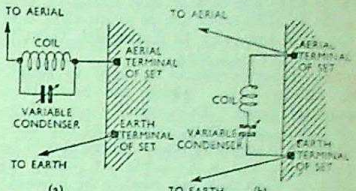
Illustrating a method of volume control. In practice, more complicated arrangements are used in order to maintain correct tonal balance at varying volume levels

reducing high or low notes disproportionately as they are adjusted. Better still are those volume controls which introduce some measure of tone control to provide good tonal balance at various volume levels.

WANDER PLUG.—A small plug such as is used for grid-bias battery and H.T. battery connections. A good fit between a plug and its socket is essential, and if it becomes loose it should, if it is of the split type, be opened out slightly with a penknife. A solid plug can be made a tighter fit with a socket if a little lead foil is wrapped round it.

WAVE BAND.—The wavelengths lying between an upper limit and a lower limit. For example, the short-wave band includes all wavelengths from ten to fifty metres.

WAVELENGTH. — The distance between any two similar points on successive waves, e.g. the crest of one wave to the crest of the next. Radio waves are measured in metres and these measurements are, in fact, of the actual lengths of the waves; that a station has, say, a wavelength of 300 metres does mean that it is vibrating space with electro-magnetic waves each 300 metres in length. The velocity of radio waves is constant, it never varies. Whatever the lengths of the waves, the velocity will always be 300,000,000 metres per second. In one second the waves travel that distance. Therefore, the higher the



Coil and condenser are tuned to wavelength of interfering station. (a) *Shows the rejector type, and* (b) *the acceptor*

frequency of the waves the shorter they must be; in fact, divide the velocity (300,000,000) by the frequency in cycles per second and the answer is the wavelength in metres.

WAVE-TRAP.—A device for preventing the reception of a station. It is not much used nowadays owing to the greatly improved selectivity of modern sets. But when the general level of set selectivity was lower, many listeners used wave-traps in order to cut out their local stations so that they could listen without interference to more distant stations.

There are two types of wave-trap, the acceptor and the rejector. The acceptor type consists of a coil and variable condenser joined in series and connected across the aerial and earth terminals of the set. At the wavelength to which the coil and condenser is tuned, they form an acceptor path and divert the energy from the set.

The rejector type of wave-trap also consists of a tuning coil and condenser, but this time they are connected in parallel and then interposed between the aerial and the aerial terminal of the set. At the wavelength to which they are tuned they offer a maximum of opposition to any radio frequency current and, therefore, a station operating on that frequency is rejected.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DOMESTIC PETS

Suggestions on Treatment and Feeding and some Practical Hints on Breeding

CANARIES

IN producing the yellow canary, man has stolen a march on Nature, which supplies no self-yellow species; nor are there many such bright-coloured birds which have a fine song.

As a matter of fact, the wild canary of the Atlantic islands whose name it bears is an olive-green bird, and many tame ones are still of that colour or pied with it. The sexes are so much alike that the only sure way to distinguish them is to hear the cock sing.

Pet canaries should be kept in square or oblong cages, which are best when made of metal. To economize space there should be no singing perch, and not more than three ordinary ones. These should be removable and a duplicate set should be kept so that they can readily be cleaned; while they should be so placed as not to cross each other if that can be avoided. The bigger the cage the better.

A mixture of seeds suitable for feeding canaries is regularly sold, and the seed-vessel must always contain a good supply; a sprig of watercress, a bunch of grass in seed, chickweed, or other green food should be given daily, or failing that a piece of sweet apple.

A bit of cuttle-fish bone wedged between the wires to gnaw at, and a small piece of stale cake when moulting, are the only other extras that should be allowed, but sand and clean water must always be available. It is best to have the food and water vessels inside the cage; a bath to hang on to the open door, if it can be procured, will be found handy.

A pair of breeding canaries must have a cage at least twice as large as a single bird's, provided with a cup-shaded nest and a bunch of moss and short hair as nesting material. They should not be paired up before the wild birds are nesting; the incubation period is a fortnight, and only the hen does the sitting.

Green Food is Essential.—When the eggs are due to hatch the birds should receive some food made of chopped hard-boiled eggs well mixed with stale bread-crumbs or biscuit, and a regular allowance of green food. This must be given all the time the young are in the nest, for the parent birds to feed them with, and should be supplied to the young themselves for some time after they begin to eat by themselves. It is important not to let this soft food become stale or sour.

Hardy as Wild Birds. — In an aviary canaries are as hardy as wild birds if first put out in warm weather, provided there is complete shelter from damp and cold winds. They are very easily bred in such a place, but if, say, a dozen are put in, only three should be cocks, as with equal numbers of each there would be too much fighting among the males, and the hens can rear the young without assistance. Two nests should be put in for each hen, and if there are some thick bushes they will nest naturally in these if given material.

White and Orange Varieties.—It is best to have the few cock birds of the brightest yellow procurable; as two bright yellows, however, must not be paired together, for fear of losing density of feather, the hens can be of the paler yellow shade. A few white birds make a nice contrast, but these are rare compared with the yellows.

If fed during the moult on the deepest-coloured marigold and nasturtium flowers procurable, instead of the ordinary green foods, yellow birds will come out more or less orange, though this effect does not last beyond that particular crop of feathers.

The very bright orange birds seen at shows are fed up on a "red feed" which is mixed with some egg food and given when they are moulting.

CATS

THE cat as we now have it has altered very little in most respects from its ancestor the African wild-cat, a shabby-looking tabby which could often be matched among the denizens of a London square; this is because it has remained a semi-wild animal choosing its own mate, and not usually developed by man into various breeds by selection.

When the pedigree of one's cat is considered of any importance, it must, of course, be enclosed in runs, and let out only under supervision. A cat-house must consist of a dry, sunny shed and a wired-in run attached, with plenty of dry earth in the shed for sanitary purposes. Great care should be taken to ensure that the entire place is kept clean and wholesome.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

All cats should have access to water as well as milk if they should want it, and the diet should be mostly animal — cats' meat, fish and a little well-boiled rice cooked along with some sort of meat, or some bread and milk for a change. Rabbit is a good and natural food, and if the cat is at all delicate it may benefit by having some raw rations.

Care must be taken not to over-feed a cat, for which a couple of meals a day should be sufficient, and one which is kept for mousing should have just so much that it will be still keen on hunting, but not so hungry that it will lose interest after catching and eating a mouse or two. The ordinary household pet, of course, takes pot-luck with the family, and as long as the food given is mostly animal, will thrive.

Some cats display a liking for raw vegetables, such as cucumber, and this taste may be indulged. Notice should also be taken of the particular kind of grass which they eat as medicine, and this should be brought to them if living where they cannot procure it for themselves.

Long-haired cats when shedding their coats are apt to get into difficulties by swallowing their loose hair when cleaning themselves, and such cats should therefore be kept regularly brushed to get rid of this hair as much as possible. During this period a half-teaspoonful of olive oil every second day is beneficial.

In country places it is best to get a cat to remain indoors at night, or it may take to poaching and come to an untimely end in consequence. In towns night life does not matter so much in the case of cats of no special value, but the resulting concerts may at times lead to unpleasantness with neighbours.

Cats are, as everyone knows, apt to leave a new place, and hence should be put in a large cage or tied up for a time when a move is made, being well petted and fed on tit-bits, and allowed to explore their surroundings gradually and under supervision. They are very nervous and highly strung, but quite capable of personal attachment and of accompanying family movings if judiciously handled.

The period of the female cat's gestation is eight weeks, and the kittens, like puppies, are born blind, but open their eyes on the tenth day. At a little over a month old weaning them can begin.

It is seldom, in the case of an ordinary cat of no breed or value, that more than one kitten can be kept, and any remarkable or attractive peculiarity should be looked out for in selecting it. A tortoiseshell tom is a treasure if one should turn up, since for some unknown reason this colour in the male cat is of extreme rarity. Half-Persians are, of course, more worth keeping than common short-hairs, and often make very handsome cats, but the crossing constitutes a reversion to the wild type, and such cats are particularly adventurous and apt to poach.

The beautiful blue-eyed cream-coloured Siamese short-hairs are also great hunters, and in connexion with this breed it is to be noted that the kittens are white, with no trace of the deep chocolate of the ears and feet which will come later on.

A motherly cat will often consent to rear the young of some other animal along with her kittens, and breeders of the blue or Arctic fox for fur have found that the foster cat will display even more fondness for a fox-cub than for a kitten of her own.

A cat belonging to a member of the Zoological Society fostered some young common red squirrels along with her kittens, and a peculiar fact was that their coats gradually became less red, till they were only creamy fawn-colour.

DOGS

THERE are over 100 distinct breeds. Many people believe that cross- or mongrel-bred animals are more intelligent than those of pure breeding, but whenever a test has been made it has been found that dogs of so-called pure lineage are equal in every way. That being so, it is a fallacy to imagine that the promiscuous intermixture of blood in any way improves an animal's mentality. At the same time, it must be admitted that the mongrel has a stronger constitution than the canine aristocrat.

If you require to breed good puppies, every care should be taken to select a suitable dog. If your bitch has any particular faults, care should be taken to see that the stud dog which you are to use is void of these, otherwise you will only tend to exaggerate them; just as you cannot breed wide skulls from two narrow ones, neither can you expect to produce short bodies from parents possessing long ones. The first inclination of a bitch approaching a desire is a slight enlargement of the parts, which may be observed for about a week; afterwards a thick discharge of mucus drains from them in small quantities, the secretion becoming thinner and more copious as time goes on, gradually changing its character to that of blood, whilst the labia grow larger, redder and more hot.

Care should be taken to see that a bitch is kept away from any dog during the period, until the time has arrived to present her for service, and afterwards she should be immediately returned to her kennel and left undisturbed. The gestation period is nine weeks, and during that period the bitch requires no special care, providing she does not have violent exercise; still, she

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

 Digitized by Arya Samaj Foundation Chennai and eGangotri

should have sufficient, and in a gentle way this should be, if anything, increased, but do not pamper her; on the other hand, allow her to settle down to a normal life. Many breeders advocate the daily addition of calcium lactate to the diet during pregnancy.

On the arrival of the seventh week the contents of the abdomen may easily be detected, and the young may be felt to move; even the movement of their limbs may be recognized, but it is not advisable for any bitch to be constantly handled.

At times certain cases arise when it is deemed advantageous by fanciers to resort to the mating of animals which are closely related to each other, in order to produce a better uniformity of type, thus enhancing certain qualities as well as reducing the number of ancestors by exactly one-half. That being so, breeders occasionally will mate a dog and a bitch of the same family, as a means which enables them to preserve and intensify family characteristics.

Brother and sister should, of course, never be used; the best alliances are between cousins, or a union between father and daughter or mother and son. There is a law in zoology that no animal can transmit a quality which it does not itself innately possess, or which none of its progenitors has ever possessed; therefore inbreeding, if resorted to with certain stock, undoubtedly has advantages, but with others it becomes a source of danger and might only help to exaggerate a fault which it is desired to eliminate.

Inbreeding does not help productiveness, and is often the cause of nervous stock being born. In the racing varieties it is prone to create a predisposition to hysteria.

The normal time for a bitch to carry her young is sixty-three days, but the puppies are often born a day or so earlier. Milk appears in the bitch's teats in due course, and this is followed by a mucous discharge from the vagina. When the latter is noticed parturition is rarely delayed beyond a day or so, and it will be found as time goes on that the bitch becomes disinclined for food and usually seeks solitude.

If you require her to whelp in new quarters she should be kennelled there at least fourteen days previously, otherwise she might hold her puppies back as long as possible, with disastrous results. As the time arrives the bitch usually retires; her desire for privacy should be respected, and for about three hours she should be left undisturbed. Afterwards the person who has her confidence should gently approach her and, if nothing has happened, beyond offering food and water but not pressing her to take them, leave her undisturbed.

After the first puppy has been born a period of about one hour usually elapses between other births. Some puppies are born head first, others the reverse; still this matters little, as it is usual at almost every whelp. After the last puppy has been delivered she will usually denote this by lying down on her bench, curling herself round, and drawing her family to her in order to get them comfortable; then she will endeavour to get the rest she so much deserves. She now requires little attention beyond a fair supply of nutritive food, and will do best if left alone and, a few hours afterwards, given a dose of castor oil or a large tablespoonful of Kaylene oil.

Many bitches at first refuse to leave their young even for exercise; occasionally they do this at the risk of injuring their own health, and the bitch should be compelled to leave them for a short period. Commence by leaving the kennel door open, letting her have sight of it all the time, and seeing that no person goes near, if you do not wish to upset her. Above all, do not allow strangers to go to the kennel, as this excites the bitch, who guards her young jealously; therefore, if you desire to show your puppies to anybody, let this be done during the period the bitch is out at exercise.

During the period of whelping straw should not be used. Some breeders have had disastrous results from this on account of young puppies becoming entangled in it, and cases have even occurred where puppies have been strangled, on account of straw being used. The best bedding for this period is sawdust or sacking; sacking securely stretched across the bench forms a good bed, being easily replaced when it becomes soiled. Straw may be used when the puppies are about eight to ten days old, but do not use too much at first, and see that the bed is kept scrupulously clean and well disinfected. You can rear healthy stock only if you keep them under sanitary conditions.

When puppies are born they are blind; their eyes open gradually until about three weeks of age, when they have their full sight. Therefore it is at this period that they should be gradually weaned. At nine or ten days, have their dew claws removed.

Puppies up to six weeks old should be fed about every two hours; at eight weeks, four to five times daily, with one of the milk foods advertised. Afterwards the diet should be varied; this may be done by using small hound meal, soaked in broth, with a little raw or cooked minced meat added. Another diet for young stock is boiled rice mixed with porridge and served with milk. Porridge given alone makes the bowels loose, but by mixing it with the rice you will find it very good and economical to use.

As soon as puppies are old enough, let them cultivate the habit of eating biscuits;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

these should at first be broken into small pieces, as young puppies are not capable of breaking them themselves. A puppy's digestive organs are as delicate as a baby's, therefore care should be taken to keep them balanced. It is easier to breed a prospective champion than it is to rear it satisfactorily. As many puppies are born with worms in the intestines, it is necessary to administer a mild vermifuge at weaning.

Cleanliness and obedience are the first two lessons a puppy should be taught, and within reason the earlier these are practised the better; but do not expect too much from him at first and, above all, treat him with firmness and kindness if you do not wish to break his spirit. Given proper attention, very young puppies can easily be schooled to cleanly habits and, as they usually relieve themselves very soon after a meal, facilities should be made available.

Train your puppy to a collar and leash at an early age if you want to avoid trouble later. Start by putting a collar and leash on, and allow the puppy to run about with the leash trailing; then, holding the leash in your hand, let the dog accompany you round the garden a few times in order to get used to it. This being once accomplished, you may afterwards take the animal out for a walk, and by degrees get him used to strange noises, so as to allow him to gain confidence. Train your puppy right; keep it under control; do not allow it to run after every dog, cat or vehicle it sees. A well-trained animal is a pleasure to be out with, but a quarrelsome or disobedient one is a source of annoyance.

With a sick dog the golden rule should be "little and often" and, if possible, the dog should be allowed to take its food naturally, as a small quantity thus eaten is better than a much larger amount that is forced upon it. A sick dog should not be crammed with food; this helps to exhaust him, and overloading the stomach does much harm.

The popular diet of a sick animal embodies milk with a beaten egg in it, and not made sweet. Chicken or rabbit broth is likewise good if the meat is finely cut up. Boiled liver is, in normal circumstances, rarely refused by any dog; but with one that is ill liver should be given with caution. Raw minced meat without the fat is good for a dog in early convalescence; meat extract will enable the animal to regain strength and substance. Grilled sweetbreads are good in moderate quantities. When in season, onions and celery boiled in the broth form a great gastric stimulant. Chopped raw cabbage and carrot on alternative days are also of good value to provide vitamins.

The best way of finding out whether your dog is in good health or sickening for something is to take its temperature with a canine clinical thermometer; not only will this enable you to tell immediately when your dog is "off colour," but it will assist you in treating before it has become really ill. The temperature of the average healthy dog is 101.5° Fahr. taken in the bowel.

When using a "clinical" thermometer, the stem should be held between the tips of the thumb and first finger, and the ball should be gently tapped against the knee until it registers 95° and the bulb lubricated with a little saliva or smeared with Vaseline. This being done, the animal's tail should then be lifted with the left hand and the thermometer gently inserted into the end of the bowel, far enough to cover the mercury, at the same time holding the tail in position horizontally so as not to interfere with your actions.

Allow the thermometer to remain in the end of the lower bowel three or four minutes; still do not grasp it so as to interfere with its proper registration, but just gently hold it with the finger-tips, so as to steady it. Another way to take a dog's temperature is under the thigh, where the normal is 100.5° Fahr.

The dog perspires, not through the pores of the skin but through the tongue. Many inexperienced people, when they notice an animal, say after a run or long, sharp walk, hang its tongue out, appear to imagine that it denotes that the animal is craving for a drink of water, but this is not necessarily the case. Just as the body of the human being evacuates the fluids of the body through the excretories of the skin, so does a dog exude his through the mouth by means of the tongue.

All dogs do not require trimming but, of the breeds that do, it will be found to be a necessary evil, if you mean to avoid your animal having an unkempt appearance. Trimming a dog might be claimed to be easy, but to trim it well is an art which is not too easily acquired, and well-known fanciers, who have kept large numbers of terriers, if preparing a dog for a show never take upon themselves the responsibility of trimming it.

Although trimming is generally defined as being merely the removal of old hair, it is undoubtedly, as normally practised, the way to assist you to make a dog look as if it had qualities which are not present. A good trimmer must of necessity be a good judge of the breed he is to strip; otherwise how can he know just where to take the hair off and where to leave it untouched?

For instance, your dog's front legs may not be perfectly straight, but if a good, experienced canine barber undertakes the task of preparing it for a show he will, by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

his take-off and leave-on principle, possibly turn your animal out with the appearance of its having a perfectly straight pair of front legs, and it may be found that this is not so only when the animal is handled.

Still, generally speaking, trimming is not resorted to with a view to deceiving the eye; it is practised so as to enable the dog to grow its new coat free from entanglement, and to give the animal an all-round smarter appearance.

Should you own a dog of a breed that requires trimming, whether you keep it as a companion or for show, see that it is trimmed with regularity; should it be a house-dog you may be able, with the aid of a trimming comb (procurable from all dog appliance firms), after watching a professional undertake the work on two or three occasions, to trim your animal well enough to make it look reasonably smart.

Normally, unless you desire to show your dog, you need not go to the expense of always calling in a professional to undertake the work. The cost of trimming a dog coat varies, according to the class of craftsman employed.

Although opinions differ as to how often a dog should be washed, it is generally admitted that all animals should have an occasional bath, so as to keep them healthy, free from skin troubles and "doggy" smells, which is very important, especially with those animals which are housed indoors. Washing softens the texture of an animal's coat, but with some breeds, in which a soft, silky coat is necessary, this does not matter; providing you do not wash them too frequently, you will do no harm.

When washing your dog, see that the water is lukewarm (the correct temperature should be about 85° Fahr.) as water which is too hot distresses the animal and causes pain. Above all, see that you make all the necessary preparations in advance, as once the operation is started it is advisable not to prolong it more than necessary.

Some people commence by washing the dog's body and finish off with the legs and feet. This is open to grave objection, for owing to the extra time during which the animal is kept with the body wet, he is more liable to catch a chill. In the first place, see that the water is filled up in the bath to the level of the dog's brisket, and after standing him in it you should commence by washing his legs and feet, lifting them one at a time while doing so. Afterwards your attention should be directed to the body and neck, rubbing the soap or shampoo well into the skin all over and then rinsing the dog in another bath of water not quite so warm as the first, in order that all soap may be removed from the body, thus leaving the coat free.

This being done, all surplus water should be sluiced off by the use of the hands and the animal then placed where it may shake itself, which will have the effect of getting rid of a further surplus. The dog should then be rubbed down with towels, and either kept well on the move until thoroughly dry or kept in a warm room. Great care should be taken to see that your dog does not catch a chill after being washed, because a vapour rises from the coat after being dried with a towel, and it is during this period that danger lurks.

Another method of drying a dog, if of the short-coated variety, is by the use of sawdust. The animal may be placed in a box containing, say, pine sawdust; this can be rubbed into the coat and allowed to drop back into the box. It is a good water absorbent, will quickly dry your dog, and at the same time is inexpensive. Care must be taken in thoroughly brushing the sawdust out of the coat; otherwise it is apt to cause skin irritation. In washing dogs with white coats, a dip of the bluebag in the rinsing water will help to make the coats whiter.

With any dog, grooming is as important as washing to ensure its being healthy and retaining a nice coat. Too many people neglect the use of the brush, and appear to think it is not necessary. All dogs should be groomed with regularity, whether their coats are long or short, soft or hard; in fact, it might be said that if more grooming were resorted to and less washing, dogs would be better in health and happier.

Soft-bristle brushes are practically useless for grooming, as they do not penetrate into the hair; they therefore have a tendency to leave the under-section of the coat untouched. Select a brush that is suitable, with either slanting bristles or otherwise, and when using it do not allow your actions to be too slow, for when grooming your dog you are assisting blood circulation, keeping the animal more healthy, the skin clean and allowing for a better and more lustrous coat. The latter can be improved by giving it a few minutes' hand rubbing after brushing.

GOATS

Goats may be said to occupy a position midway between pets and animals kept for practical purposes. Cheerful, clean and the equals of any tame animal in intelligence, they are eminently companionable, and at the same time the most reliable of all for the supply of milk.

Goats will eat a great variety of plants, and are better pleased with armfuls of weeds, vegetable trimmings and tree prunings than a bit of fine pasture; thus

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they can be kept anywhere, even in a paved yard.

When on the land they are very useful for clearing off weeds and scrub, but generally have to be tethered out to graze to prevent trespassing and getting into mischief. The chain should be provided with swivels to prevent twisting up, and pegs well driven home and shifted frequently. Some shelter from the rain is highly desirable, for goats hate wet, though the Asiatic animals have long run wild in so damp a climate as the Scottish Highlands and manage to survive there somehow. A dry shed is needed at night, but no litter.

A feed of horse-corn, oats, beans or a bran mash should be given daily, or some hay, and a good time to give this food is at milking, to keep the animal quiet, at which time it may also have a lump of salt to lick. Pure water is a necessity, and so is clean food, for the goat, though blessed with a very omnivorous appetite, is not a dirty feeder and is particular about the state of its food. Turnip and carrot tops with the peelings from vegetable roots make a valuable addition to the diet.

The goat's gestation is between five and six months, and two kids are commonly born. They are most amusing and playful little things, but in most cases a billy kid will not be wanted for keeping, and so may be disposed of for the table, on which he will be a good substitute for chicken if killed when quite young and tender. If kept to be broken to harness, he must not be driven at a fast pace.

GOLDFISH

THE goldfish is a native of China and, though it was imported thence as a tame fish of beautiful colour, still exists there in the simple bronze tint it wears in the wild state. There are also many such bronze goldfish now at large in Britain, and even the tame ones begin life in the bronze uniform, showing other colours at an inch or two in length. Some never lose the bronze tint, however.

The most favoured and usual hue is the bright red-gold, which may be variegated with black or white; there are also all-white or silver fish, and a yellow variety, which is really of a gold colour. Tricolour fish are also common, but those showing a blue tinge, or merely black and white, are rare.

There is no sex difference noticeable except a growth of heavy pimples on the cheeks of male fish in the spring. Two males should be allowed to each female in stocking a pond or tank for breeding. Fan-tailed fish or other peculiarly formed breeds should not be kept along with those of the ordinary type, as they are less hardy and not active enough to get their fair share of rations. This is the more necessary because fish in a bowl or aquarium should receive only what is barely necessary in the way of food, for fear that any should be left to taint the water.

The food, of which dried "ants' eggs," stale bread-crumbs, or crushed vermicelli are suitable, should be soaked and dropped in, a small pinch at a time, ceasing to give any as soon as the fish allow it to sink to the bottom.

Some water-thyme or Canadian weed should be placed in the aquarium if possible, as this will grow while floating and provide some green food in its shoots. Failing this, watercress may be used but must be left in only a few days, as it is not a true aquatic plant and will soon die off. It is not necessary frequently to change the water, but some should be dipped out daily and replaced with fresh to keep it clear and sweet. A few water-snails will help by acting as scavengers. A thin spawn will serve to feed the fish.

Fish must never be crowded in a bowl or tank; two three-inch specimens, or three two-inch ones, are enough to put in a vessel a foot in diameter. A couple of contrasted colours, such as black and yellow and red and white, or self-gold and silver, or red and yellow, will produce a very pretty effect.

Fish bowls or aquaria must not be exposed to scorching sun or frost, but goldfish of the common sorts will live quite well out of doors in a pond about three feet deep if first put out in warm weather, and, if there is plenty of weed, will breed there, attaching the spawn to this. In such a place they will grow nearly as large as herrings and live for many years.

So long as they are secure against the reach of frost, fish are better in shallow water, especially when in tanks, as it is the breadth of surface that enables the water to absorb from the air the oxygen which the fish need for breathing.

In an outdoor pond the weeds, any water-snail spawn, and insects that fall in, will supply a good deal of food, and only a little stale bread need be given in addition to this natural supply, though of course a good deal will depend on the size of the pond.

GUINEA-PIGS

GUINEA-PIGS have advanced in dignity in our day, having become fanciers' animals and being regularly exhibited at shows under their correct name of cavies. They are not pigs, but rodents, and are natives of South America, where they were domesticated by the inhabitants before the Spanish conquest of that continent.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

They are singularly helpless little animals, being unable to climb, fight, burrow, or even run fast; but they make up for this to some extent by their extreme precocity and independence. They are born not only well furred, open-eyed, and able to run about, but provided with teeth, so that they begin to clean themselves in a day or two and can do without their mother's milk in three weeks.

All through their lives they are very hearty eaters and, though to be fed on the whole like rabbits, will take a greater variety of green food, and are less easily upset by the administration of it. They are rather fonder of water, and some should be always in their hutch, care being taken that it cannot be upset there and make the surroundings damp, as they need a dry, comfortable bed as much as rabbits do, if not more so, since they come from a warmer climate. A small quantity of tea leaves mixed with oatmeal provide a welcome change in feeding.

There is no objection to keeping the two sexes of guinea-pigs together, but only one boar should be put into a hutch in which there may be as many as six sows. The gestation period is nine weeks, and each female should have a little covered box full of hay as a bedroom to herself.

Guinea-pigs show much variety in colour; those of a rat-like brown represent the original wild shade of coat. The fur is naturally smooth, but there is a quaint, rough-coated variety, and also one with a very long straight coat which quite hides its form. This needs too much care to be everybody's pet.

Cavies taste exceedingly like rabbits; they are best made into a pie or spread out flat and fried with bacon, for which treatment their small size suits them.

HEDGEHOGS

THE hedgehog is a pet which can often be had literally for the picking up, for it is often to be met with on quiet roads, and when pressed does not try to run away but rolls itself up and trusts to the protection of its prickers.

It can be kept in a hutch like a rabbit, or allowed to run about in an enclosure with a smooth fence, for it will climb up an ordinary wall and escape, in spite of its awkward appearance. It can be fed on raw meat and bread and milk, much like a domestic cat or a ferret, in fact, and is a great destroyer of insects and other small life, including cockroaches in cellars—and also, unfortunately, young chickens. When kindly treated a hedgehog soon grows tame and ceases to erect its spines upon being approached.

Its hutch should have a retiring-room filled with dry dead leaves, or a watertight box similarly provided should be placed in any enclosure it inhabits; here it will sleep for the winter, but it should be looked at from time to time to see if it has awakened and is in want of anything.

MICE, FANCY

MICE, being to all intents and purposes miniature rats, must be accommodated in the same way, but on a smaller scale.

Their cage need not be allowed more space than six inches square per mouse, and should have a small, cosy retiring room filled loosely with soft paper. The food should be birdseed instead of chicken-corn, and any milk used to make stale-bread sop for them should be diluted by half with water. Green grass-seed is the best raw vegetable food, but some raw vegetables or fruit, should be given daily, as for rats. Water should be placed in some small vessel which cannot be upset and make the cage damp.

Susceptible to Cold.—As mice are delicate little things and very susceptible to cold, their cage should be kept indoors, and the open part should be covered with wire gauze or perforated zinc. It is desirable to have two cages, so that every now and then one can be thoroughly scalded out and dried, by way of keeping down the very pronounced smell of these little animals; while, of course, a liberal bedding of sawdust or chaff is always necessary.

A pair can usually be kept together, but some bucks cannot be trusted when the doe has young. The gestation period is three weeks, and the young are born naked and blind, like young rats. They can see in a few days, and then get their fur and begin to eat for themselves.

Black-eyed Whites.—Mice can claim quite a number of fanciers, and a great variety of pretty colours and markings are to be found among them. Those who admire a white mouse, but do not like its usual pink eyes, may be interested in the black-eyed whites. Mice showing two colours, except when pied with white, or tricoloured ones, are very rare and should be taken care of.

Short-lived Animals.—Mice are short-lived animals, two or three years being their limit, but their activity and enterprise enable them to make the most of a short existence. When tame they can be let out for exercise; an old dry aquarium makes a good gymnasium for them, and they much enjoy exercise in a wire wheel.

PIGEONS

PIGEONS, being natives of Britain, can often be treated in much the same way as wild birds, and indeed exist practically as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

such on large farms, although they appear to have been first domesticated in Asia.

Nesting Boxes.—In preparing a home for pigeons, it is important to see that each pair have two nesting boxes at least nine inches square, and that there is no continuous ledge running along the front of these, otherwise not only will there be constant squabbling between adjacent pairs, but the half-grown young of a previous brood will come into the box where their mother is sitting on the next lot of eggs and bother her to be fed. For pigeons have but small broods of two at a time, but keep on breeding so continuously that the cock is attending to one couple while the hen is hatching the next.

Sitting.—Both sexes sit, the cock from about 10 a.m. to about 5 p.m. and the hen the rest of the time; she will not sit all by herself. The incubation period is seventeen days.

The young leave the nest in about a month, and it is just before this, when they have been well crammed by their parents and have taken practically no exercise, that they are at their best for the table. Soon after they can fly they learn to feed themselves, and are henceforth independent.

If coloured, they can be distinguished from old birds for some time by the absence of the metallic hues on the neck, but it needs practice, even with adult pigeons, to distinguish the sexes, the cooing and pestering of the cock being the best guide for beginners.

Pigeons which are meant for high or long-distance flying must be confined in their shed or aviary except when at work, and receive full meals regularly after their exercise; they must not be allowed to sit about on the roofs.

Homers and High-flyers.—Training to "home" is done by first letting the young birds fly around by themselves, then taking them a little distance away and letting them out, increasing the mileage flown till during the first year a bird will return from a 100-mile flight, a distance which can be greatly exceeded later on in its life if it proves to be a good worker.

Food.—Homers and high-flyers are of special breeds, and they have to be fed on a special mixture of best-quality peas, corn, etc.; and pigeons have large appetites. But birds allowed to fly about as they like can be given any corn or scraps and should find most of their own food; "fielding," or getting food in a natural way in the open, which is a grave fault in a professional flyer, is just what an ordinary pigeon is required to do.

Unlike the common wood-pigeon, house-pigeons are harmless as a rule when feeding thus, eating mostly weed-seeds, small slugs and snails, etc., and they can be allowed to rake in a garden without damage.

Pigeons fed by hand should have bunches of lettuce and other green stuff tied up in their house to pick at, and a mixture of rock salt, gravel and old mortar as a condiment. A good supply of water for drinking must also be maintained, and a bath offered two or three times a week.

Some of the best pigeons are White Swiss Mondains, which are large but not unwieldy or eccentric in shape, and have beautiful red eye-rings, matching their feet. White pigeons in a town, however, soon become soiled, while in the country they are not only ornamental but less likely than coloured to be shot in mistake for wood-pigeons. Fantails should be avoided if pigeons are kept for practical purposes.

When Pigeons are Moved.—When introducing pigeons to a new place, they should be shut up for at least a fortnight, being kept well fed. When giving them their liberty it is advisable to put the hen in a cage outside the loft for a day. The cock, being free, will get to know the surroundings, but will not go far away from the hen. After they are let out and know the place well, rations can be shortened by degrees as they learn to provide for themselves. If specially valuable, it may be as well to keep them shut in till they are rearing young, and in the case of old homers this is necessary.

RABBITS

Rabbits have become much more important during the present century than they have ever been before, owing to the great development of the use of their skins in the fur trade as substitutes for the more expensive pelts, while they are none the less suitable for pets or for the table than they were when the skin was rarely of much value.

Although rabbits originated in the dry regions of the western end of the Mediterranean, where the ancients spoke of them as little burrowing hares, they have long become perfectly established in Britain's damp climate, but still suffer in damp winters, and in captivity should at all costs be accommodated with a perfectly dry hutch, raised off the ground and quite watertight.

Bedding and Food.—Except in the case of the long-wooled Angora breed, which must be kept on a straw bed for the sake of its coat, there should be a thick layer of sawdust, chaff or similar litter on the floor of the hutch. A doe's hutch will also need a retiring-room at one end, where she may make her nest undisturbed; it does not do to leave the pair in the same hutch.

Some hay, especially clover hay, should

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

always be at the disposal of the rabbits, to nibble at as well as to nestle in; but they should also have a daily meal of oats, bran or such mash as is made up for fowls. Green food is also an important part of their diet, but must be given with discretion. If they have been kept short of it, they will eat too much should they receive as much as they would like at once, and it will similarly disagree with them if given wet, withered or frosted, when it might cause gastritis and enteritis.

Vegetable trimmings, grass, sow-thistle, etc., can be obtained for nothing, and by balancing the green rations with a supply of dry food the rabbits can be kept very cheaply. It is best not to overdo cabbage leaves and, if any green food is short, to give some stale bread well soaked in water, or used tea leaves mixed with meal.

If no such moist food is given, water must be supplied in a vessel which cannot be upset. This should also be seen to when a doe is expected to litter, as one of the causes which may make her eat her young is want of moisture; another is disturbing her by looking at them, which should only be done when she is in the outside compartment and busy feeding.

The gestation period of a rabbit is thirty days, and the young are born not only blind, but naked. They are kept warm in the nest by a lining of fur which the doe pulls from her own coat for the purpose. After the ninth day they can see, and will begin to eat and hop about at a month old, but they must be left with the mother for a month longer before removal. A bread-and-milk diet is a good one to wean them on.

Rabbits for Fur.—Their colour may alter very much with age; for instance, silver-grey rabbits are black in their first fur. The best rabbits for fur are the modern Rex breed, which have plush-like coats resembling that of the mole, and are now obtainable in various colours, including chinchilla grey, which is remarkably like the real and valuable fur of that kind.

White Angoras.—The long-wooled white angoras are, however, very popular, as they yield a crop of wool every year. This is taken at shedding-time, when it comes away easily so as to leave no flushing of the skin, and if in tip-top condition will fetch quite a large sum for manufacturing fancy articles of dress. Angora rabbits need to be brushed every day.

A rabbit should not be picked up by the ears unless the body is supported by hand; it is better to hold the loose skin at the back.

RAVENS

Now that parrots cannot be imported, the British talking birds may be expected to resume some of their old-time popularity. Of these the raven is the most convenient and interesting to keep, as it is big enough to be allowed to go about with a clipped wing with a reasonable chance of safety for itself—although this will not render it immune from mischief, for it is a confirmed practical joker and thief.

It often talks in a gruff sepulchral tone, and the male has a way of puffing out his long throat feathers to look like a beard. The hen does not do this, though her feathering there is similar.

Except for tricks like this, the sexes of the raven are remarkably alike, but young birds can be distinguished from adults by their pale bluish eyes and by having the inside of the mouth red instead of black. Ravens are fond of bathing and should be fed mostly on raw animal food. They have been known to breed in captivity, but need a big aviary if not allowed to range about.

SQUIRRELS

CAGES are rather too small as permanent homes for such active creatures as squirrels, which should be lodged in pairs in a large packing-case outdoors, provided with branches for exercise, and a retiring box filled with hay and dead leaves.

The food should be nuts, corn, fruit and bread and milk, with now and then half a hard-boiled egg or a chicken or rabbit bone or two to pick. The water supply should not be forgotten.

When tame, and not young, squirrels can be let out and allowed to live at liberty about the place.

TORTOISES

THE common land tortoises of the Mediterranean region have long been favourite British pets, and it is strange that cold-blooded reptiles from this sunny climate can endure Britain's as they do. They do not, however, like sun except in strict moderation, and avoid it when it is scorching, and they seek protection from the winter by digging themselves in in the autumn.

If they show any undue delay about doing this, it is just as well to put them in a box of earth in a cellar or shed to sleep the winter out; and if they dig in naturally the place should be marked to avoid accidentally digging them up and giving them their death of cold in the winter.

A pan or two of water sunk level with the ground should be at their disposal, and they particularly want a drink when coming out of their winter sleep. They should be fed up as well as possible in summer, being given plenty of lettuce and dandelion—most people know nowadays that they are vegetarians, feeding on herbs and fruit. If they can be persuaded to take some bread and milk in addition, so much the better.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DICTIONARY OF CANINE DISEASES

How to Diagnose and Treat Them

DOGS are intelligent, honourable and useful creatures; hence mankind domesticated them in order that they should be of the fullest service. In primitive days the dog lived in a wild state.

One often hears it said that a dog should do this or that, and if living under natural conditions it would do him good. Be this as it may, we must not overlook the fact that the domesticated dog does not live under natural conditions; hence what might not have injured his forefathers may now easily cause him suffering. The dog today, even under the best conditions, is called upon to live an unnatural life, and is also housed artificially. In prehistoric days it was quite possible for the dog to change his locality four times a year, because ground that was suitable for him to roam about on in one of the four seasons was quite unsuitable for him during another period. The call of nature moved him on to other pastures, where he could not only find suitable foods but live under better conditions. Yet all the time nature meant him to be a worker. He had to search strenuously for his food, and at the same time select what he thought would be suitable for his digestion; meat, herbage and wild grass possibly forming his main diet.

Let those who keep a dog try to understand it better. Nothing will be lost by keeping in sight its primitive habits and, above all, not feeding it too often, for would not the dog, in a state of nature, search for his prey and, after he had caught, killed and torn it to pieces, make one meal only during twenty-four hours? And who can deny that during the process of feeding from the flesh much earth would be swallowed? When we serve food or water to an animal we should serve it clean and wholesome, and the vessels should be cleaned immediately they are finished with, as nothing is more liable to upset an animal's stomach than food which is sour. The only point to make is that should your dog prefer to eat his meal from a dirt-covered floor, do not become unduly distressed. Many people are of the opinion that when a dog has a cold, moist nose, it indicates good health; still, as the standard of health varies with animals, it is best to see if additional symptoms are present. That being so, let us remember that the absence of the bright, clear eye, loss of appetite and staring coat also denote immediately that something is wrong; therefore it is up to us to take all possible care to discover what is really the matter.

If you suspect illness, take your dog's temperature, feel his pulse, and endeavour to diagnose what he is suffering from. In illness you will possibly find his face pinched, which indicates pain, and even if he does not moan he will appear nervous, and by his countenance indicate to you that he feels ill. Should you be in doubt as to what ails him, your best plan is to keep him warm and comfortable and send for a veterinary surgeon; but should it only be a simple ailment you may be able to treat him yourself and soon get him well, bearing in mind that with illness the dog's diet should not be reduced only but changed, seeing that all foods are well served in scrupulously clean vessels and in quantities that are not too large, because an animal which might try to eat when a little is served up might very probably refuse to eat if a quantity of food were put before him.

One may sometimes hear it said that when dog owners have faith in a medicine which they are administering to their animals, their dogs usually get better; but this is a fallacy, and if owners have assumed it, possibly it has been because these particular animals have in the first place not been more than slightly ill; therefore the abstinence from food for a period has allowed them to regain normal health. All too many people overfeed their dogs, and far too much medicine is given to animals which do not require it. We should realize that the giving of powders or mixtures to an animal with regularity, in the course of time may have little or no effect, and instead of doing the work which is intended this physic might be little more than useless.

ABRASION.—This is usually caused by the dog's own teeth, due to biting an itching part; it may, however, be the result of accident or of skin trouble.

Treatment.—Should the abrasion be caused by biting, it should be damped with a solution of zinc, borax, alum or Acriflavine. If caused by accident, zinc ointment should be used and, after healing, the dog should be washed thoroughly, a little borax being included in the rinsing water.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ABSCESS.—This is the result of foreign bodies, or bruises and thorns, or it may be caused by blows. Abscesses may form on any part of the dog's body, often causing intense pain, swelling, and sometimes fever.

Treatment.—After hot fomentations they should be poulticed with wet lint, kept damp by the use of a piece of oiled silk. The poultices will either bring to a head or disperse the abscess. When pus forms, free by incision, squeezing the matter out gently and keeping the wound open by a pledget of boric lint to enable it to heal from the bottom. In really serious cases a poultice of antiphlogistine is advisable.

ADMINISTRATION OF MEDICINES.—Many inexperienced dog-owners appear to find difficulty in giving their animals medicines. With pills these are often very difficult, as the dog's mouth has to be held open and the pills driven down, otherwise the animal will emit them; also with liquids the inexperienced person may have trouble. When giving a dog pills you should hold his face with your left-hand palm pressing on his nasal bones and with your forefinger and thumb press gently on each side of the upper lip, thus causing him to open his mouth, and as his lips will just overlap his teeth he is unable to close the mouth against you for fear of hurting himself. Once the mouth is opened you should give the pill, holding this between the tips of the first and second fingers, and pushing it gently right over the back of the tongue, just as if you were trying to push it through the back of its head. Should it reach the fauces he will be bound to swallow it. Do not attempt to gag the dog; this only excites him and does harm. The giving an animal liquids is much simpler. Place your left hand round the animal's muzzle so as to keep it closed, then with the right hand insert a finger into the lips and draw the skin away so as to form a funnel or pocket and pour into this the liquid medicine desired. When this is done, while still holding the muzzle, gently tickle the animal's throat, in which case he will usually gulp the medicine down. To give powders, open the dog's mouth and drop them upon the tongue, when the saliva will be of sufficient moisture to cause them to be swallowed and insufficient to allow them to be emitted.

AMAUROSIS.—This is brought about through a partially paralysed state of the nerves. It is a sort of blindness to which some dogs are subject; sometimes it is referred to as *gutta serena* from the dilated pupil and glassy look. Not only is the animal's sight affected, but likewise its action. Sometimes the disease is caused through worms, and where this is the case it behoves you to see that these pests are eradicated with all speed. It may, on the other hand, be the result of decayed teeth, in which case extraction by a veterinary surgeon should be done. In many cases, especially in brood bitches, it is due to a deficiency of calcium in the system. See that the feeding is on the right lines, diet light but nourishing, and the animal kept quiet.

Treatment.—Occasionally a small blister behind each ear has been found beneficial. Give a nerve tonic of ½ to 4 grains of sulphate of zinc made up in pill form with extract of dandelion. Tablets with calcium and vitamin D are also indicated.

ANÆMIA.—This is often the result of worms, bad feeding, or being housed in quarters that are damp, insanitary or badly ventilated. Dogs that are anæmic often suffer from blotch or surfeit—this being characterized by the appearance of reddish patches which ultimately become sores. The animal's gums, likewise the mucous membranes, appear pale and bloodless; the dog loses all energy, becomes weak and, owing to its poor constitution, is liable to contact any of the many diseases to which the canine race is subject.

Treatment.—Good ventilated quarters, a healthy environment, plenty of fresh air, good nourishing food and exercise. Give raw minced meat occasionally; keep the bowels moving freely, and administer daily a tonic to tone up the system. A good tonic in pill form is arsen trioxide gr. 1/36, ferri sulph gr. 1, ex. nux vom gr. 1/32.

ASTHMA.—This is usually the result of over and bad feeding, and very often is to be found in old and petted dogs. Usually it increases the animal's appetite; sweet seasoned articles and meat appear to be relished by it and, although it appears to have a craving for these, other foods will be left untouched by the affected animal. It is not a fatal disease but if proper treatment is not applied one finds the animal is liable to have its digestion so deranged as to make it usually susceptible to other disorders, which may prove very dangerous. With asthma, piles are usually met with; the animal's coat is generally in a bad condition and in places patches of hair are missing; the membranes of the eyes are congested; the nose is often dry, the teeth covered with tartar and the breath offensive. The animal appears in distress, being slothful and lacking in energy.

Treatment.—A coarse vegetable diet; no flesh must be given. The dog should be compelled to take plenty of fresh-air exercise, even if it makes it appear as though the exercise was harmful. Grooming should be done daily, and this should be of a rather vigorous kind. Opium, hyoscyamus, belladonna and asafœtida given in small

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

doses may be tried in succession; and when the fit is on, one to three leeches to the chest may help to give immediate benefit. A pill containing morph hydrochlor gr. 1/50, atropinae sulph gr. 1/150, pulo scillae gr. ½, pulo epicac gr. 1/12, ext conii gr. ½, should be administered three times daily.

BALD SPOTS.—These are often the result of eczema.

Treatment.—A little green iodide of mercury should be rubbed into the skin gently and very sparingly; the following day the spot should be washed and then dressed daily with one of the well-known skin ointments.

BILIOUSNESS.—Animals that suffer from this have poor appetites; usually their noses are hot, likewise the mouth. They will vomit in the morning, and if they eat grass will emit a frothy yellow bile.

Treatment.—The bowels should be kept open, first by giving a dose of castor-oil, following this up daily by Easton syrup. Should the animal not be desirous of feeding, give a quinine pill mixed up with extract of taraxa, ½—1 grain of quinine, according to the animal's size, or a pill containing calomel gr. ½, sacchlact gr. 4.

BOILS.—When these appear it will be either the result of general weakness, a sequel to worms, or distemper. With animals that are just getting over the latter, boils are very common; likewise with young puppies. Animals that are affected by them become very cross, owing to the pain they are called upon to endure. With an old animal they often denote overrichness of the blood, or foulness. Irrespective of age, when boils show themselves it is necessary to eradicate the cause.

Treatment.—Poultice or use hot fomentations so as to bring boils to a head. When they are soft, early incision is advisable, afterwards using an antiseptic dressing. Give the animal increased exercise, plenty of green food, and bath it oftener. Give internally pills twice daily: ferri sulph grs. 5, acid arsen gr. 1/100.

BOWEL DISEASES.—A dog will fill his stomach, if allowed, with unsuitable foods, and expose himself to various diseases. We should bear in mind that the dog is of peculiar construction: it has no colon, and the guts are nearly all of one size from the beginning to the end. Its cæcum is little more than a small appendage—a small sac which is attached to the main tube, with but one small diminutive opening—and as all the food has to pass through this intestine, owing to its peculiar formation it is readily liable to be disordered. The dog is naturally to a great extent a costive animal and it has to employ considerable straining in order to expel its fæces, because of lack of moisture which is natural in the rectum. Hence, should the natural secretion become deficient, it denotes clearly that the intestines have lost their activity, and if we do nothing to assist much suffering will be caused and other illnesses follow.

Treatment.—Give an enema of the solution of soap, or of Epsom salts, from 1 to 4 oz. in a ¼ pint to 1 quart of water; or inject from ½ drachm to 4 drachms of turpentine beaten up with the yolk of the same number of eggs as there are drachms of the oil and mixed with the quantity of water above stated. A tablespoonful of Kaylene oil should be given daily, or pills: creta prep gr. 2, ferri carb gr. 1, pulo opii gr. ½, pulo ipecac gr. ½.

BRIGHT'S DISEASE (Albuminuria).—This disease can be diagnosed in an animal only by the examination of the urine. This is done by placing some of the urine in a test tube, boiling it, and adding one or two drops of nitric acid. Should the disease be present it will show itself by the urine becoming cloudy, or with a white sediment. With this disease treatment is often unsatisfactory, and it is best to call in professional aid; but those who are unable to do this may try the following:

Treatment.—Milk, barley water, meat, fish, eggs and biscuits steeped in broth. Thrice daily give carbonate of iron pills, from ½ to 1 pill, according to size.

BRONCHOCELE.—This disease consists of an enlargement of the thyroid body, and may increase to such an extent as to destroy life. It is more severe in puppies, and terriers (mostly bull-terriers) and spaniels are likewise often subject to an attack of it. In young pups the thyroid body enlarges greatly and quickly, and usually the animal dies before it is six weeks old. With adults the disease is not what might be termed fatal but harassing, because the enlarged thyroid body presses upon the trachea of the jugular veins, thus restricting the blood flow.

Treatment.—Administer iodine by the mouth; closely shave the hair of the enlargement and paint the enlargement with a camel-hair brush with some of the tincture of the same drug. (Iodine should be used fresh, as this is an active ingredient which loses much of the major part of its virtue within one week.) The animal's throat should be painted with a tincture made with spirits of wine, 1 oz.: iodide of potassium, a drachm. One of these pills may be given: potas iodid gr. 2; quin sulph gr. 1. Give three times daily.

CANINE DENTISTRY.—Teething troubles never occur until a puppy is about three months old, and in such cases are frequently cured by immediate removal of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

temporary teeth. With adult animals, teeth abstraction is, of course, not quite so simple. A dog's age may be fairly well guessed by an expert after the animal is fifteen months old, due to the fact that it is at about this period that tartar on the teeth commences. The only remedy for diseased teeth is abstraction, and as the gastric juice of a dog has twice the digestive power of that of man, the necessity of artificials is not nearly so great. A dog can live and thrive on soft food very well without any teeth whatever.

CANINE INFLUENZA.—This does not assume the same catarrhal form as with human beings, and usually begins as gastritis; often it is accompanied with symptoms of "nerves," inability to stand still, and might advance to actual paralysis.

Treatment.—If the influenza is detected in its early stages, bismuth and hydrocyanic treatment should be given, but should the disease have a good hold it is best to call in a veterinary surgeon to prescribe for it. An effective pill, three times daily, is: iodine gr. 1/25, creosote gr. ¼, bichromate of potash gr. 1/20.

CANKER.—This is not uncommon in dogs, especially long-eared breeds. You will find that the affected dog holds his head on one side, shakes it often, and is always ready to scratch it. A dog's ear has, on its inner surface, two kinds of glands which secrete respectively wax together with a greasy matter for keeping the ear pliable and soft. Should these glands become irritated by dust, water or other agents, they are liable to become inflamed and, instead of protecting the parts and lubricating them, they discharge an acrid matter which assists in spreading the inflammatory area, and ends in ulcerations of various sizes and shapes. Hence no irritants should be poured into the affected ear.

Treatment.—Warm, in a spoon over the gas jet, a drachm or two of ol. amygd., dulc. dispensed secundum artem; bring it to the temperature of the body and pour into the ear. After repeating for a few days, the meatus should be cleaned out by the use of a bone penholder, covered lightly but tightly with cotton wool, great care being taken to remove all the debris without causing injury to the delicate and sensitive lining of the ear. During the process of treatment it is best to put the dog on its side, holding it down both gently and firmly; this enables you to undertake the task with greater speed and efficiency. In serious cases it is much better to leave the dressing of the ear to a vet.

CATARRH.—This is sometimes called a common cold or coryza. Often it is the result of neglect. Animals with a weak system are liable to it if they are left out in the cold or wet; likewise, dogs which are forced to sleep in kennels that are not watertight are usually sufferers. With young puppies which are reared in a badly ventilated kennel and get very little fresh air exercise we usually see it prevail, and although in its early stages it is not dangerous it will, if not checked, be disastrous at a later period.

Treatment.—See that the animal has warm, dry quarters, but well ventilated. Give it a dose of castor oil, and at night from 1½ drachms to 1 oz. of mindererus spirit, the doses varying according to the animal's size. In the morning give a bolus of nitre, soap and sulphur.

CHOREA.—Usually a sequel of distemper, and the most difficult of all canine diseases to treat successfully. It is an interrupted supply of nerve force, and the animal's muscles all over the body will twitch, the face, neck and limbs appearing to be the most affected areas. Although in most cases it follows distemper, the disease may be the result of irritation from worms, injury to the head, or diseased teeth. No satisfactory treatment has yet been found. Various drugs have from time to time been tried with a fair amount of success; valerian, asafœtida, quinine, ammonia, salts of iron, copper, zinc, silver, arsenic and other all have strong advocates. Pills composed of quinine sulph gr. 1, phosphori pur gr. 1/30, ferri redact gr. 3, will help.

COLIC.—This causes an animal intense suffering and calls for immediate relief, or inflammation will speedily ensue and death follow. Should it occur a week to ten days prior to a bitch whelping it may be cured; but if the attack happens to come during, or just after, parturition, in practically every case the bitch perishes. At no season, and in no circumstances, may we ignore it; the pitiable cries which the animal sets up during an attack of colic are so distressing as to enforce the attention of any who are within sound. No warning of the complaint is previously given. The dog may appear to be in good health; it takes its meal in the usual manner, and then lies down to have a rest and aid digestion. Shortly afterwards—when the dog appears to be sleeping—a moan is heard; this is quickly followed by another; the animal appears to be restless, and will get up so as to change its position; this being done it then appears to settle down again to go to sleep, but the rest is soon broken and the dog's voice grows more loud and full. The animal's voice is rich, natural and sonorous during simple spasms, but harsh, short, high and broken, like a series of disconnected "yaps," when inflammation is present.

Treatment.—Give a turpentine enema. Should this not cut short the attack give

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

injections of laudanum or ether every half-hour; the first three injections, however, may be given at intervals of fifteen minutes. Cathartic pills should be administered, and should the bowels not be moved castor oil may be given, but if cathartic has been used a period of from eight to twelve hours should elapse before giving castor oil.

CONSTIPATION.—This is a frequent ocurrence in dogs. With a healthy animal the fæces should be somewhat hard. Occasionally a moderate amount of defæcation takes place; still, under ordinary conditions little notice need be taken of it. Yet if this is repeatedly observed, it may be necessary to give the animal some assistance in the way of an enema of soap and water. Constipation is often caused by eating bones—not gnawing them—like those of mutton chops, poultry and game.

Treatment.—In addition to the ordinary diet, green food, spinach and cabbage may be minced with the table bits, but not too much of the greens. Meat, of course, is to be given in the ordinary way. A simple aperient of 10 to 20 grains of pulverized jalapæ can be readily given by dropping it on the animal's tongue, and if desired one or two grains of calomel may be added. A good pill as an aperient is pulv. jalapæ and pulv. cambogiæ, 10 grains of each.

CYSTITIS.—Possibly better known as inflammation of the bladder. It may be brought on as a result of cold, but often it is due to an animal having been given irritant medicines; and in bad cases a dog suffering from it may have a stone or the passage of gravel into the urethra. When cystitis is present the animal frequently whines, and appears to have difficulty in passing its urine which, instead of coming with the usual flow, is only passed in drops with every effort causing intense pain. The animal's belly becomes swollen and very tender to the touch; his bowels are affected; he is very costive, yet with straining it is possible that a slight diarrhœa might set up, often stained with blood. With a dog which cannot pass its water and appears in distress, no time should be lost in calling in a veterinary surgeon, in order that he may pass an elastic catheter so as to bring about relief.

Treatment.—On no account neglect the bowels, but do not give any irritant purgatives, as with this disease they are liable to cause death. Small doses of olive oil may be given three times daily if they seem necessary, and to relieve the pain opium in small doses may be given. When the affected dog is of a small breed, a hot bath will sometimes give instant relief.

Diet.—It is necessary to give light and tasty foods, and only those which are easily digested. Drink: barley water, linseed tea, milk demulcent, etc.

DANDRUFF.—This might be termed a scurfy condition of the dog's skin, and calls for a cooling medicine. Animals which are affected with dandruff shed the scaly epidermis which has been brought on through want of exercise or injudicious feeding. It is also associated with shedding of the coat. The owner should refrain from using a sharp comb or a hard-bristle brush.

Treatment.—Green food in plenty, with an occasional supply of liver in addition to other food. Wash about the end of the first month, using a mild soap, and put a little borax in the water, say one drachm to one gallon.

DEAFNESS.—This may be caused by the mats or tags of woolly hair on the large-eared hairy breeds of animal, which are sometimes formed on the inside of the flap, thus preventing natural evaporation at the base of the ear, and thereby causing a green offensive pus to be discharged. Another cause may be a blow or a fall, which leads deafness to come on suddenly. It is also, in some cases, hereditary.

Treatment.—For number one cause, apply warm fomentation with warm water and glycerine, and carefully remove with scissors the matted hair, afterwards giving a daily application of ointment containing ung. zinci. ol, amydg. dulc. and lanolini, which may be procured through any chemist. In the second case give a brisk aperient, say of mag. sulph. with tr. jalapæ, so as to divert congestion.

DIABETES.—With this disease the animal's coat becomes harsh, dry and staring, the mouth hot and dry, the animal has a continual thirst, and its bowels become constipated. Sooner or later emaciation comes on, and once the disease fairly sets in the animal's death usually follows.

Treatment.—With diabetes it is best to take no risk, but to call in a veterinary surgeon and accept his guidance; it is impossible to treat an animal successfully for this disease yourself, and delays are dangerous.

DISINFECTANTS.—It may be wondered by some people what these have to do with canine diseases, but in reality the subject is of sufficient importance for it to find a place in this dictionary of diseases, and if it helps as a warning to readers to safeguard some of their stock, it will have fulfilled a useful purpose.

Disinfectants and dogs, as a general rule, appear in most kennels to go hand in hand, and whilst there are many good disinfectants upon the market, some others are mere deodorizers, with absolutely no germ-killing power. Dogs are extremely

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

susceptible to carbolic poisoning, so carbolic disinfectants should not be used in baths unless they are highly dilute. When purchasing a disinfectant, if you are not quite sure, ask your chemist to guide you.

DISLOCATION OF BONES.—This is denoted by their displacement from the normal position, when the affected bones become immobile. Animals of all ages may become so affected, and it should be realized that the earlier treatment is applied the better, as time adds to the difficulty of correcting the trouble.

Treatment.—Get an assistant to hold the socket of the dislocated joint both steadily and firmly; while he does this, attempt to pull and work the dislocated joint back into its proper position, afterwards applying cold lotions to the joint in order to avert the danger of inflammation. Care should be taken that the animal is afterwards allowed as much rest as possible for a few days.

DISTEMPER.—Of all diseases, distemper is the most dreaded and, after worms, the most common ailment to which dogs are subject. It carries off thousands of our best specimens yearly, and may, if not combated, wipe out the inmates of a large kennel in a few weeks.

A great deal of progress has been made during the past few years towards finding a definite cure but, although veterinary science has done much to alleviate suffering and save the lives of animals, we cannot yet claim to have entirely conquered the problem.

More recently, however, a great step in this direction has been made by the Distemper Research Body, whose findings have been issued at length. They show that they can to a large extent combat the serious losses for which the disease has been responsible; so effective is the remedy they have produced that they have been able to prove that when their treatment has been applied, the losses have been reduced to 0.3 per cent; this is the greatest stride ever made.

In spite of the fact that opinions still differ as to whether the disease is contagious or infectious, it is best in the interests of all to assume both, and thus be safeguarded as much as possible. Distemper is a virus which inhabits the nasal organs, thereby causing a virulent discharge as the disease develops. It is, without doubt, a fever that attacks dogs differently, and is at times accompanied by pneumonia, and affection of the brain, heart or other internal organs.

It is generally found that the first symptom is loss of appetite; the dog ultimately refuses to touch food at all, but is ever ready for a drink of water. He then becomes feverish, his nose hot, and his eyes lose their usual keenness of vision. He will intimate to you that he does not wish to be disturbed, and will lie quietly on his bench as if he has neither the energy nor strength to move.

The ailing dog's quarters should be moderately warm, dry and free from grass. They should be well ventilated, as a stuffy atmosphere is detrimental. His food will require to be varied from the ordinary menu, and it will be found necessary to offer him tasty morsels to get him to eat, but a large quantity should never be put before him; on the other hand, "little and often" should be the slogan. Fresh eggs beaten up with milk, milk puddings (without sugar), brown bread (without crust) soaked with milk, and boiled fish are all suitable diets. Meat should not be given, as it retards progress. Still, if your dog will take nothing else, you may give him just a little; an animal sickening with distemper does not require anything like the same amount of food as a healthy one.

The symptoms previously referred to are followed by a thick yellow discharge from the eyes and nostrils, and this, if not attended to, will entirely close the former and stop the passage of the latter; therefore they should be sponged occasionally with lukewarm water containing a good disinfectant.

Most unfortunately, distemper does not show itself immediately a dog has contracted it; it takes from seven to twenty-one days before the disease becomes noticeable. Hence healthy dogs become infected, as during that time an animal which has distemper may be mixing with healthy dogs and spreading the disease. The greatest danger with distemper is when it is taken by puppies under seven weeks old, and by puppies that are teething at about four months old; therefore it is urgently necessary that strict caution be taken with young stock, remembering that a puppy cannot resist the disease like an adult.

A dog suffering from distemper loses flesh rapidly, even if a fair amount of food be taken, and as the fever increases the lungs become affected, the breathing irregular and the breath offensive. Diarrhœa usually sets in, and the temperature of the dog will often rise to 104 deg. Fahr., dropping in a day or two to practically normal, only to rise again later. If the animal does not improve, his nervous system will be attacked; the muscles over his forehead throb and twitch and fits often occur, which lessen your chance of curing him.

Another form is termed the dry distemper. This usually affects young stock and is accompanied by "mattery" spots on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stomach, inside the thighs, and sometimes all over the body. Of the two forms the latter is probably the more dangerous, as the inexperienced owner often fails to observe it until it has got a strong hold on the animal, making it therefore more difficult to cure than would be the case under earlier treatment. It is not practicable to give a treatment for this dreaded disease, because according to what hold it has got on the animal so treatment varies. It is best to call in a veterinary surgeon, or to purchase one of the well-known distemper medicines, of which several are available. In every case of distemper, daily hypodermic injections of caniseran are indicated. These very often effect a cure.

DYSENTERY. — With this disease animals are usually subject to frequent stools of much straining, and the matter ejected is often liquid and scybalus, with mucus and some quantity of blood. The animal is often restless and usually dull, it has a great thirst, and more or less is suffering from a fever. An examination of the anus shows it to be puffy, red and sore. When this is associated with the passing of blood, hypodermic injections of coagulen-cibra are indicated.

Treatment.—The diet must be light, nutritious and easily digestible. Patent barley, bread and milk, eggs, cream or jellies, and barley water or other demulcent drink, may be given in moderate quantities but not left for long exposed. Give a dose of castor oil, and about three hours later an enema of gruel. When administering the castor oil, a few drops of liquid extract of opium may be given, but its quantity should be regulated according to the animal's strength. Thrice daily give 5 to 25 grains of trisnitrate of bismuth, and apply hot fomentations and linseed-meal poultices —to which a tablespoonful of mustard has been mixed—to the abdomen. In ordinary cases, 5 gr. tablets of sulphaguanidine every four hours speedily bring relief.

DYSPEPSIA.—This is not only very painful, but to a dog it is a fatal disease if in the acute stage. It is often caused through poisons or the result of excessive doses of tartar emetic. The animal with dyspepsia has a great thirst, high fever, and is constantly vomiting; sometimes it may vomit blood from the rupture of an artery. In bad cases enteritis generally is present, and the animal's limbs and ears are cold.

Treatment. — Warm baths and hot fomentations, the latter being given towards the regions of the stomach. Feed on beef-tea mixed in cream, so as to keep the animal's strength up, and, according to size and weight, give from 4 to 30 grains of trisnitrate of bismuth before each meal.

ECZEMA.—A common disease amongst dogs. Often it is mistaken for mange, although of quite a different origin. Eczema is often difficult to treat and, as it usually shows itself without being preceded by any preliminary symptoms, it is practically impossible to guard against its outbreak. It is not contagious or infectious, and may originate in a kennel to which no other dogs have access, even if the animal has been housed under the most sanitary conditions. The first symptoms are found all along the belly, under the legs and also in other hairless portions of the body, which appear intense red in colour; later this will be followed by numerous bladders or vesicles. These vary in size, and have a distinct character; they contain a thin watery fluid which, when they break, coalesces to form a scabby skin; this produces a confluent mass which may be easily mistaken for a scald or burn, having its origin in the vesicular eruption known as eczema. The disease is often caused through a too limited dietary; therefore a change of food is usually the best remedy, irrespective of what the usual diet has been. Cases have occurred when eczema has been cured by the dog being given a liberal supply of horseflesh, whereas other dogs have been made ill by a liberal supply of milk.

Treatment.—The dog should be prevented from scratching, and given a daily bath of glycerine 1 part, water 60 parts. With a long-haired dog that is delicate and not fit for a bath a lotion should be applied, sponged on the affected parts. To this may be added potassa sulphurata. In simple cases give an aperient of syrupus rhamna and olive oil, followed by a mixture of bircarbonate of potash, sulphur, magnesia, syrup rhocados or pills composed of arsen iodid gr. 1/12, hyd iodid rub gr. 1/12, twice daily.

ENEMAS.—When an animal has constipation it is often advisable to give an enema. Usually warm soapy water is used for this, and the ordinary balloon-shaped syringe used, but this must be filled so as to prevent air bubbles being thrown up. See that the tube as well as the anus are oiled, and after the operation the dog should be allowed to lie down quietly while the matter is softening.

FITS. — An animal that is subject to these should at all times be kept quiet, and in no circumstances allowed to become excited. There are many causes why fits occur; in young puppies they are termed convulsions although they resemble epileptic fits.

Treatment. — Keep the animal in a darkened room and allow it to remain

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

quiet; when it is able to swallow give bromide of potassium (2 to 20 grains according to the animal's size) in a little camphor water two or three times daily, keeping him on a milk diet. Should the fits occur often, give three grains of phenobarbitone daily for three days.

FLEAS.—Those who keep their animals clean should never be pestered with fleas. Still, with visiting bitches, or where dogs have been allowed to enter an infected kennel, they are sometimes found.

Treatment.—Use one of the advertised powders, and afterwards dust it off, using for the purpose a good stiff brush and working vigorously. When doing this it is best to take your dog well away from the precincts of the kennel; say, on to a grass plot. After brushing you should give your animal a bath, using a medicated soap, and in returning the dog to the kennel see that clean straw is provided. It is little use otherwise.

FRACTURES.—When an animal's bone is fractured it is usually the result of direct or indirect violence. Of course, it is always best to call in the services of a veterinary surgeon, but with just a simple fracture the owner of the animal may be capable of treating it himself, providing he takes due caution, but as it is important to get correct splinting it must not be assumed that it is easy.

Treatment.—First reduce the fracture by placing the bones in their natural position, then bandage or splint the bone in order to keep it in its proper position and give it the opportunity of knitting together again without any disfigurement. For splints, wood may be used, or gutta-percha cut into slips might be more suitable, due to the fact that if it is placed in moderately warm water it softens, thus enabling it to be easily shaped and moulded.

GASTRITIS.—This arises from a variety of causes, and is known as inflammation of the stomach. It may be caused by decomposed food, especially fish, or by bones or other hard food. It is most prevalent in damp cold weather. When it is present in puppies it is often the result of worms or of swallowing foreign substances, coal, stones, etc.

Gastritis is quite often accompanied by bilious attacks, and the symptoms are excessive vomiting and great thirst. Do not allow the patient to have access to drinking water, as it makes him sick and aggravates the complaint.

Treatment.—*See* DYSPEPSIA.

HARVEST BUGS.—One of the species of jiggers or fleas, and often found in many kinds of vegetable and dry grass during the summer and autumn periods only. They are small, and when they get on to a dog are practically invisible to the eye; nevertheless, they burrow under the skin, causing the animal to be uncomfortable, owing to the intolerable itching they produce.

Treatment.—Apply ordinary liquid ammonia, afterwards washing the dog and then rubbing in a little oil. A weak decoction of tobacco is also very good.

HEPATITIS.—It should be realized by all dog-owners that an animal's liver is very susceptible to disease. The biliary gland soon becomes deranged, sometimes inflamed, often enlarged, seldom diminished. Very few dogs, indeed, have healthy livers; yet owing to the difficulty that owners have in detecting this disordered condition of the gland, it is possible for an animal to suffer for a long period without its owner knowing it.

Excessive indulgence by the owner and overfeeding are the roots of the trouble; one rarely sees a well-worked gundog or a half-starved mongrel suffering from this complaint, but the pampered pets of ladies are those in which we usually find it. It is not, as some people imagine, the result of mange, although one often finds obstinate skin diseases common with animals as a result of chronic hepatitis. With a fat animal the visible mucous membranes may be pallid, the pulse full and quick, the tongue white, the appetite good, the bowels irregular, the anus enlarged, the fæces natural, the rump denuded of hair and the naked skin covered with a thickened scaly cuticle.

Treatment. — Gradually reduce the amount of food given daily, and divide it into three or four meals. Give a tonic to strengthen the system and occasionally administer a dose of cathartic pills, should a purgative be required. Leeches may be placed upon the hard places, regulated, of course, by the animal's sustaining ability; give medicine from ½ to 1 teaspoonful (according to the size of the animal) three times a day of the following: iodide of potassium 2 drachms 2 scruples, simple syrup 6 oz., liquor potassæ 1½ oz., water 12 oz.

HOT FEET.—This is often caused by long runs on hard dry ground; it is an inflammatory disorder which attacks the animal's feet. The paws are usually swollen, they become hot and are very tender.

Treatment.—The animal should be given rest and placed on a light diet; gentle purgatives should be given and the affected parts should either be poulticed, or fuller's earth and lanoline or lard applied. Any of these will quickly restore the animal.

HYSTERIA.—This might very well be termed a mystery disease, because nobody appears to know where it has come from,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and exactly how it can be combated—even veterinary surgeons of the highest repute are sometimes mystified. They have helped us in finding remedies which can bring relief and cure, but they have not got down as yet to the root of the trouble, and until this is discovered we shall never be able to find a preventative.

The complaint of hysteria is often referred to as "fright disease"—a very appropriate title indeed, because during an attack of hysteria the animal appears to be full of fright. Research continues, so the cause of hysteria will undoubtedly sooner or later be found out, and we must therefore have patience. Some time ago it was argued that hysteria arose through dogs eating biscuits. It was said by these people that dog-biscuits, owing to their process of manufacture, were lacking in vitamins, but this theory was soon upset because the scientist proved it to be otherwise. What is further, we find such animals as greyhounds, which are not fed on a biscuit diet, liable to an attack of hysteria just as other breeds.

One certain fact is that hysteria is a nervous complaint which attacks animals without any previous warning. Excitement possibly plays a great part but man has never been able definitely to understand fully the canine mind. Nevertheless, there is no doubt whatever that in at least 95 per cent of cases hysteria is one of the results of a faulty diet. It will be found that during an attack of hysteria the dog will rush about barking or howling, and appears to be quite blind. He may even attempt to climb a wall or enclosure, and then he will rush away into the darkest available corner to hide himself.

The first recognizable symptoms which will be noticed are that the animal appears to be in a fit, froth coming from the mouth and the teeth chattering; very often the animal loses control of the bowels at the same time.

Treatment.—The first thing to do is to prevent the animal from injuring himself. Whilst taking good care that he cannot bite you, hold him firmly, cover his head with a dark damp cloth and try and soothe him, remembering that when the attack is at its height the dog may bite the hand of the one he loves most; but as at this period he appears to have no control over himself, and cannot understand what he is doing, we may possibly forgive his actions. After the attack has subsided, give 10 grains of potassium bromide dissolved in 2 tablespoonfuls of water, and place him in a quiet and darkened kennel or room for about three hours undisturbed. Afterwards, for the period of about ten days, put him on a light diet and keep him from all excitement. Give a mild aperient and completely change the diet, eliminating biscuits and substituting porridge. After feeding, give calcium lactate, 5 gr.

INDIGESTION.—This is more common than most canine owners imagine, and a great deal of the cause lies with the owner himself.

Many foods which are good for the human race are absolutely unfit for dogs. Often we find puppies will show an ingenuity in procuring foods which even give them stomach-ache. Most skin affections are attributed to indigestion. The fault lies usually with the owner, whose love of the dog weakens him to such an extent that he often gives food which he knows to be bad from the standpoint of health, but which the dog appears to relish. How often do we see a pampered pet which, when offered a biscuit or a piece of bread, refuses it, and if it is then offered to another animal will seize it, place it on the floor and stand over it, just because another is ready to eat it. Your treatment is simple; the dog should be placed upon an allowance, and the right food only given. Some fanciers have been known to starve a dog for ninety hours, but this seems too drastic. Still, if water is given the dog, twenty-four hours without food will not impair his health and will give him an opportunity of getting rid of the surplus he had and toning himself up. It should also be borne in mind that a diet consisting of nothing but meat is not good, and dog-meal or biscuits should form part of the daily menu.

INFLAMMATION OF THE BOWELS.—This causes great pain, the animal becomes restless, and the tenderness is such that the dog cannot bear the parts to be touched.

The complaint may be mistaken for poisoning, whilst vomiting, diarrhœa or even constipation may be present. Indigestible food, worms, or the eating of carrion is often the cause of this illness.

Treatment.—Keep the animal cool and quiet; give a dose of castor oil with a few drops of laudanum added, and afterwards apply hot fomentations. As soon as the bowels are moved, give a little laudanum in solution of chloroform three times daily, applying a flannel bandage to the dog during the period of convalescence, and giving no solid foods; sloppy foods such as arrowroot, beef-tea or cornflour made with eggs are most suitable.

INFLAMMATION OF THE EYES.—Should the inflammation be acute, it is best to keep the animal in a darkened room so as to minimize the suffering, and encourage it to have as much rest as possible.

Treatment. — Lower the diet, giving sloppy foods, beef-tea, milk or Bovril. Give

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a dose of castor oil and syrup of buckthorn mixture to open the bowels, and keep these open with a little raw liver. Keep the eyes bathed and, with the aid of an eye-dropper or camel-hair brush, drops may be put into the eyes, the lotion for this being 1 grain of sulphate of zinc to 1 oz. of water. Yellow oxide of mercury ointment, heated and dropped into the eyes once daily, is also very good.

INFLAMMATION OF THE TONGUE.—This often arises from bites. It is well to wash the mouth out with a solution of permanganate of potash twice a day and feed on soft foods. A suitable diet is porridge and tripe; a little liver may also be given. Where much swelling has occurred, give an aperient and call in a veterinary surgeon, as possibly one or two incisions may be needed. In addition paint the tongue with glycerine of thymol.

JAUNDICE.—The commonest type found in dogs is lepto-spiral jaundice, which is an infectious disease spread by rats; the malady should be easily recognized. If examined, it will be found that the conjunctival membrane (white of the eye) is yellow in colour, or possibly dark orange in tint. This likewise extends to the skin. The colour of the nude parts will, together with the inter-digital spaces, when examined, soon tell you what to deal with. It occurs most often in dogs which have been continually lying in front of the fire and leading an idle life, together with indulgence in rich foods, and once started, if not immediately dealt with will cause death.

Treatment.—For this dangerous disease, give agocholine tablets in half a glass of warm water every morning. Apply hot fomentations to the region of the liver, smearing the belly with belladonna liniment. Keep the bowels open and afterwards give salines of sulphate of magnesia and sulphate of soda, of ½ to 2 drachms of each in water.

MANGE.—Very often this disease remains unnoticed until it has got a good hold and, as it is very infectious, those animals suffering from it should be kept away from healthy stock. Mange is caused by a parasite which causes the dog to scratch and break the vesicles, thus enabling the disease to spread.

Treatment.—Give the dog a dilute carbolic wash. Care must be taken with this, as some dogs are very susceptible to carbolic poisoning. Then apply to the parts a compound sulphur ointment, and in very bad cases green iodide of mercury with it, but only one-third of the bulk should be added as the iodide is so strong, and, if used, too much caution cannot be taken; it should be applied only to one part of the dog's body at a time. With compound sulphur, when used by itself, it will be found a good and safe application.

After the above treatment for three or four days, the animal should be again washed, taking the greatest care to see that it does not catch a chill.

PAIN.—With an animal suffering intense pain, a hot sponge may give more relief than the application of fomentations; the higher the temperature of the animal the greater will be the relief. The method to adopt is to dip the sponge into very hot water, squeeze out, and then immediately pass it over the painful part. Many dog-owners, however, use hot bran or sand placed in a bag, or a hot-water bottle. All these are at times very useful, but with animals that are suffering from congestion of internal parts the heat from a blazing fire is often the best, as is a sunlight bath. The alternate application of cold and hot compresses will help to give some relief.

PARALYSIS. — With a dog's hind-quarters, paralysis may be caused through deranged bowels. The stomach has a great deal to do with the legs, because the latter have to depend upon the stomach for all their nourishment. Yet we must realize that certain foods, when given in moderate quantities, are good and nourishing; but when given in excess are liable to bring on many diseases.

Dog owners should always bear in mind that their animal can, and often will, consume in a few minutes sufficient provender to last it for twenty-four hours, and that if a family pet it may be given many tit-bits in addition to its regular meals. Hence many dogs become over-fat and, as time goes on, they may be seen dragging their hind legs along, thus causing owners to become worried and immediately calling in a veterinary surgeon to see what the trouble is. This done, it is often found that the animal soon begins to get better; but no sooner does it improve than the owner again commences to fall back into his former ways and usually gives the animal all that it requires and as often as it wishes. Thus, usually, the second attack quickly comes on, which is more troublesome than the first. The veterinary surgeon is again brought in to right the wrong; yet often this does not make the owner sufficiently cautious and, in cases where excessive feeding is again resorted to, a third and what might prove to be an incurable attack occurs.

Treatment.—In many cases paralysis is due to calcium deficiency, and hypodermic injections will quickly relieve the animal.

PNEUMONIA. — This is an uncommon disease in dogs, except when distemper accompanies it, although it may be caused

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

by a chill. Fever accompanies pneumonia, the temperature rising two or more degrees above normal. The dog becomes dull, he is off his food, his breathing is short and quick, whilst his mouth is closed—with pneumonia he never pants with open mouth—his pulse quickens, and the eyes become bloodshot.

In the first stage a cough does not always accompany pneumonia, but following the acute stage a husky cough generally presents itself. It must be remembered that a dog does not expectorate, and therefore brings up phlegm into his throat and afterwards swallows it. Usually a cough is a good sign, and nothing should be done to stop it unless it is a really distressing one. Nursing and feeding play a very important part and, even on the appearance of a slight recovery, precautions should be taken to see that nothing happens to give the patient a set-back.

In some very severe cases it will be found that the animal cannot swallow any food, and in such cases the patient should be fed up the rectum into the lower bowel. This is done by means of a syringe, and after the food is given it is absorbed into the other bowels and enables the animal to live. Cases are known of dogs that have not been able to take food through the mouth for five weeks, but have lived and become healthy when fed in the manner above described; but the food which has been given has been in a concentrated form, as quality and not quantity is what is most needed. In bad cases a little oxygen given once an hour is a great help. This may easily be procured and is not expensive. In severe cases the dog cannot lie down; his lungs are so bad that he remains standing; the legs become swollen, whilst he looks for a place to rest his head.

With pneumonia, as a rule, underfeeding rather than otherwise should be resorted to, and the dog requires good nursing and warm dry quarters of a temperature of 55 deg. to 60 deg. Fahr.

Treatment.—The animal should be put on a course of M and B tablets, and should it not drink of its own free will, a plentiful supply of water must be administered with a spoon. A thick covering of anti-phlogistine must be applied to the thoracic ribs and covered with a layer of cotton wool. The latter can be held in position with a portion of an old cardigan jacket. The nose should be smeared with vaseline to prevent any discharge from the passages blistering it. If there is much difficulty in breathing, inhalations of boiling water and friar's balsam should be given frequently. A proper steam kettle or an oil burner can be of great value.

POISONS.—After taking poison, the dog must be made to vomit to enable it to rid itself of any which may remain in the stomach. The first symptoms are restlessness, followed by a jerking of the whole of the muscles of the body, the dog dropping down, violently convulsed. In strychnine poisoning, the head is drawn back, the whole body and limbs twitch, the breathing is irregular. The limbs become rigid, the hind legs stretched backwards and the forelegs forward. The dog has spasms which last a minute or so and the convulsions return, each time more severe, until death occurs.

In all cases of suspected poisoning, give a dog an emetic quickly. The following may be found satisfactory: a dose of salt from ½ to 2 teaspoonfuls, according to the animal's size. This may be given in warm water and repeated about forty minutes later, should spasms continue. A piece of common washing soda placed down the throat may also be found satisfactory. Should the dog be unable to swallow, from ½ to 2 teaspoonfuls of laudanum mixed with tepid water should be injected into the bowels with an enema syringe. If strychnine poisoning shows itself in severe muscular twitchings, administer a small plug of tobacco at once. The nicotine acts as an antidote. A piece of washing soda about half the size of a walnut acts as a very quick emetic and is easy to procure.

PREVENTING BREEDING.—Those owners of animals whose bitch has gone astray and who are not desirous of her breeding, may prevent this should they—at the earliest possible opportunity—syringe out the womb with a solution of alum and water, or of quinine. Should an owner not want the bitch to breed at all, then the operation of ovariotomy can be easily and cheaply performed. A still better alternative is to get your veterinary surgeon to inject Stilboestrol.

RABIES.—Rabies is most dreaded of all diseases affecting dogs, especially because of the fact that it may be transmitted, not only to other animals, but also to man himself, by means of a virus contained in the saliva. The first symptom is that the dog appears sad and listless; he will seek darkness and often lose his appetite, his eyes become redder and brighter than usual, and he appears to have a fixed gaze. He whines but does not bark, and will go to a vessel and try to drink, but deglutition becomes impossible as the disease progresses. The animal is suffering intense agony and denotes it by biting at his bed or anything which he can get hold of. He will, if fastened by a chain, snap at and endeavour to break it, and if he can get loose he will do his best to escape and keep

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on the move until exhaustion and death take place. Such an animal is a great danger and it is liable to bite any person or animal. It should be kept securely fastened up and a veterinary surgeon should be called. Seeing that we have no known remedy for the malady, should your veterinary surgeon confirm the suspicion the sooner the animal is killed the better. A suspected case of rabies must be reported to the police at once, and on their report the Board of Agriculture takes stringent action.

RECTUM.—With a dog in perfect health the anus should be small, close, firm and entirely retracted. Should the fundament protrude, or if it presents a sensible projection to the touch, the animal's digestion is not good. Should the orifice be enlarged the position is worse and it will not be long before cracks and ulcers may be detected upon the borders of the opening, these being at a later period constantly moistened by an unctuous fetid discharge. Should the lips of the orifice be gently pulled aside, the inward section of the membrane will show a bright scarlet colour, which is moistened with a watery fluid. During health the animal's bowels are never relaxed and the straining it employs to expel its fæces is sufficient to suggest the injury to which the rectum is exposed. If the body be delicate, bone and other hard substances pass through it without affecting the powers of assimilation; they become hard and sharp projections when surrounded by, and fixed in, a solid mass characteristic of the excrement of the dog. Hence a pointed piece of bone, projecting from a firm body, is liable to lacerate the tender and soft membrane over which it would have to be propelled. The anus of a dog is often as indicative of the general state of the dog's body as is the tongue with man. To correct the trouble, the feeding should be first attended to and the diet strictly regulated, but not reduced too much in either quality or quantity. Lean meat should form the main food and the animal should be given plenty of exercise and a daily cold bath.

Treatment.—Use an ointment made up of 2 drachms of camphor, 1 drachm strong mercurial ointment, 1 drachm of powdered opium, 1 oz. elder ointment. This should be smeared over the exterior of, and also inserted up, the rectum thrice a day. Frequently in very old dogs the anal glands become enlarged and congested. In these cases a finger should be smeared with Vaseline, then inserted into the rectum, and the swelling should be gently massaged with a rotatory movement of the finger.

RESPIRATORY ORGANS.—The dog's larynx is affected in various ways. It opens at the back of the mouth and all the air which inflates the lungs must pass through it. The smallest particle of salt or a drop of saliva is sufficient to cause the most painful irritation, because the lining membrane of the larynx is the most tender structure of the body and has many peculiarities. The larynx is, in the throat of man, spoken of as "Adam's apple," but in the dog it is called a "little box," and the organ is so sensitive that it is often the seat of some disease.

Treatment.—A gentle emetic each morning for about five days, with a laxative occasionally if the bowels are torpid. Apply a mustard poultice to the throat, but if it unduly distresses the animal remove it. Leeches to the throat are good; likewise a wet bandage round the neck. The best internal medicine is syrup of squills and syrup of glycerine. Mix two ounces of each and give a teaspoonful four times daily.

RHEUMATISM. — This should receive immediate attention. It is generally found in dogs that have been neglected and compelled to lie for long periods on either flags, concrete or stone in addition to dampness, thus causing, as in human beings, uric acid. The dog's movements become stiff, he often walks with lameness, and when lying down is reluctant to get up.

As the rheumatism becomes increasingly acute he will become restless and feverish, because an inflammation of the tendons, ligaments and muscle-sheaths takes place; his urine becomes scanty and high in colour, giving a strong acid reaction; his bowels are confined. Thus, in very bad cases, it may result in partial or complete paralysis of the hindquarters.

Treatment.—The dog should be put on a milk diet and kept in a dry warm kennel. His bowels should be cleared with a saline purgative and afterwards kept open with a morning dose of Epsom salts. The specific for this complaint is salicylate of soda, 5 gr., added to 2 gr. of lactose. Give this four times daily.

RICKETS.—Although rickets are common among puppies, it is safe to say that the proportion of animals now affected is not by any means as great as was the case a quarter of a century ago. Possibly we can account for this owing to values having gone up for pure-bred stock, and owners knowing that if they wish to sell them at a good figure, or keep them even for show purposes, it pays them best to see that the puppies they breed are well reared, free from rickets and straight on the legs. Puppies in the nest can develop rickets from their own mother if she is a weakling. They are also liable to get them if they are taken from the nest and weaned at a too-early age, especially if they are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

fed on a diet which is unsuitable for their digestion. The breathing of foul air, and dampness, are likewise causes. With rickets you will notice the animal has occasional attacks of diarrhœa; its coat becomes harsh, dirty and staring; its fore-legs appear to bend under it with the weight of its body, and more or less will be found a tumefaction of the belly.

Treatment.—See that the dog is placed in a good, warm, dry kennel and allowed plenty of exercise and sunshine; should he be constipated, give an occasional dose of castor oil, say once a week; other days a small dose of best medicinal cod-liver oil. Virol in conjunction with Parish's syrup of phosphates is good and will help considerably to strengthen the constitution; bone-meal is likewise good for rickets. A brood bitch when two weeks from whelping should have plenty of lime water to drink, and a universal tonic twice daily after feeding. Puppies should always be reared on dry ground.

RINGWORM.—The result of a parasitic vegetable fungus having attacked the roots of the hair. It is contagious and usually attacks the abdomen, legs, forehead and bridge of the nose. With this disease dry brittle crusts will form. These are yellow, gradually increase in size, and red depressions will appear underneath which often bleed; an itchiness may also be present.

Treatment.—Remove scabs and apply tincture of iodine to the sore part. Keep the animal isolated; see that kennel and bedding are scrupulously clean and well disinfected. If more than one dog is kept, any vessel used for the infected patient should be washed separately.

TICKS.—These sometimes affect sporting dogs which have been used in the field and possibly make their way through thickets and coverts. Ticks are not large, but once on a dog will suck its blood until the parasite is nearly the size of a pea.

Treatment.—The best and safest treatment is a non-poisonous sheep dip mixed in a bath, taken twice weekly.

ULCERS.—Irrespective of where these are situated they call for similar treatment. An antiseptic lotion should be applied, and if very foul apply a touch of blue-stone or lunar caustic.

If swelling, poultice round the ulcer, then dress it with zinc ointment and put the animal on a good strengthening diet. Should granulations form to any extent in indolent ulcers, touch gently once daily with a silver nitrate pencil.

URINARY ORGANS. — In all cases where these regions are affected, they should be immediately treated. Occasionally, painful tumours will form about these parts and, unless they are treated in the right manner, they will rapidly get worse. Irrespective of the sex of your animal, whenever you suspect anything wrong with its urinary organs call in a qualified veterinary surgeon. Delays are dangerous.

WORMS. — These cause the death of thousands of dogs annually, and are responsible for most doggy ailments. Many puppies are even born with worms, inheriting them from their mothers. No dog or puppy can enjoy health while possessing these parasites.

There are two kinds which are most common—round-worms and tape-worms. The former are very often present in large numbers in nearly all puppies; they cause indigestion, exceptional distension of the stomach—especially after each meal—and irregular action of the bowels, very often accompanied by obstinate diarrhœa. Other symptoms are vomiting, gripes and fits; whilst in a puppy the constitution is often so weakened that rickets result. Puppies suffering from worms do not thrive or grow as they should, and in many cases suffer from eczema, which causes constant irritation and scratching. Very strong and properly fed puppies may have worms without showing them at first, but their presence in the intestines must retard progress and health. Round-worms are not confined to puppies only, but also affect adult dogs, and often tape-worms are accompanied by round-worms. The symptoms of worms in dogs are diarrhœa and occasional vomiting, staring coat, bad breath, variable or depraved appetite.

Treatment.—In dosing for worms, with most medicines the stomach should be practically empty of food — with the exception of very young puppies—otherwise medicine does not readily act on the worms, and no food should be given for four to six hours after dosing, and then only a light meal. But one of the best treatments for round and tape worms is Nemurals, which is taken in tabloid form. For the administration of these tablets it is not necessary to starve the animal, and in most cases a light breakfast can safely be given prior to the dosing.

WOUNDS. — When these occur it is necessary to clean the wound, stop the bleeding and, by a clean antiseptic dressing, protect the wound from outward contamination. No person should attempt to dress a wound until he has cleaned his hands, providing soap and water are available, otherwise he takes the risk of poisoning it before it heals. Should the wound be a severe one it is best to call in a veterinary surgeon immediately, because his skill may very probably be required.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

POULTRY-KEEPING FOR PLEASURE AND PROFIT

Practical Hints on Rearing and Feeding

DUCKS

IN the case of the common duck, we are dealing with the tame descendants of one of our best-known wild birds, the mallard or common wild duck, so familiar as a protected bird in parks. In this state it weighs about three pounds, and the drake has a very rich, handsome plumage; the two little curls in the tail remain in tame drakes of all colours, except during the summer months, when drakes go into duck plumage. They can still be distinguished then, however, by their hoarse, faint voices.

The duck is much more sociable than the fowl or even the turkey, and is a greedy and omnivorous forager on land as well as water and by night as well as day; but in the tame state it has lost to a great extent the maternal instinct and seldom goes broody, so that eggs are usually put under hens, which rear the ducklings well.

It has also lost its vigorous powers of flight, and a single breadth of wire netting or some wicker hurdles will keep tame ducks within bounds. Thus they are easily penned wherever they are wanted to destroy vermin and weeds, and they can also be driven like turkeys.

Water in a vessel of sufficient depth to enable them to immerse their heads completely should always be supplied, or they will get sore eyes; they should also have a bath large enough to give them a complete wash, or their plumage will lose its proverbial water-shedding power, and there will be risk of chills.

A sponge bath or a shallow tank on low wheels will suffice for this, with a slatted duckboard to help access; something that can be moved about and readily filled or emptied is better than a small dug-out pond which soon becomes the centre of a quagmire, even if it be self-flushed. Of course, this is presuming that the ducks have not access to a stream or pond, which they will much appreciate though they can do quite well without it. Ample foraging ground, especially grass, is quite as important.

For small permanent earth runs, ducks are most unsuitable; they make in such places a great deal of mess, noise, smell, and suffer from want of exercise, as they do not scratch like fowls. If space is at all restricted the earth should be frequently turned over and sprinkled with lime.

Ducks need housing only where there is fear of foxes; their homes should be even more freely ventilated than a fowl-house, and need frequent removal of the litter, which must not be allowed to become damp. No perches or rests are needed, but a good wide entrance with duckboard to give a gentle ascent if the house is movable and raised, as it ought to be.

Feeding.—A supply of grit and oyster shells should be given in the water, and also any corn that is used, but ducks can be fed on mash entirely, and that of a bulky character, containing bran and boiled vegetables, as well as some meat or fish, although herring is apt to flavour the yolks. One meal a day is enough for layers and breeders, and water should always be handy, as they need to rinse their bills frequently while eating mash.

If they have to be shut in at night this should be given in the evenings, but where they can be safely left out it is all to the good, as they can do much useful hunting, especially of slugs, at night when small life is abroad. In this case the meal should be given in the morning.

If they have access to any natural body of water they must perforce be shut in till ten o'clock in the morning, when they will have laid, otherwise many eggs will be laid when they are afloat and thus will be lost. In this case a water-vessel should be fixed on the wall at such a height that they cannot splash the water about.

Nutritious Ducks' Eggs.—Ducks' eggs are much more important now than they were a generation ago, and they are more economical in use, as one is equivalent to one and a half hen's eggs. Good laying ducks will lay as well as the best hens, and lay well for twice the number of years.

For commerce and rearing for table the duck has long been known. Ducklings need the warmth of a parent or brooder for only about two weeks and will fatten themselves if kept from swimming and from running

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

about too much, and supplied with constant meals of mash, so that they are constantly eating or sleeping.

For laying ducks it is not necessary to have the companionship of a drake, but for breeders a drake should be provided for every half-dozen ducks in the lighter breeds, or every three or four in the heavier; and as drakes do not fight like cocks, more than one can be run in the same flock.

Ducklings.—The eggs take four weeks to hatch, and the ducklings must at first be fed on the same food as recommended for young chicks, with plenty of water to wash it down, and a supply of duckweed if possible. They take, however, very kindly to chickweed as a substitute, and must have some sort of tender greens. Their need for getting their heads under water must be recognized even at the earliest age, but in providing bathing-pans, particular care must be taken to see that they can get in and out of them easily.

Range on natural water with hen fosters, who can protect them only on land, is risky, but they should have plenty of exercise on land in runs or without, as circumstances permit, if being reared as layers or breeders; it is only the table birds that need to be confined and "pushed on" with frequent meals, and these only should have fat in their mash. Corn need not be given to any growing ducks.

Light and Heavy Breeds.—As in fowls, there are light and heavy breeds of ducks, the former being the better layers and the latter, of course, the better for table. The heavy white Aylesbury with the flesh coloured pink (which shows pink even in the day-old duckling) is the best of these, making its weight earliest.

The best layer is the brown Khaki Campbell, a duck of ordinary shape and size; but the slim erect Runner comes very close to it in this, and owing to its speed on land and good foraging power is cheaper to keep.

How to Handle Ducks.—The ducklings are ready for killing when feathered and will lose weight for a time if kept on much after their wing-quills, which come last, have grown. At this time the ducks stop squeaking and begin to quack, so that the sexes can be sorted out long before the drakes' tail-curls appear.

In handling ducks they should be grasped by the lower part of the neck—the legs are easily strained and should not be used as handles.

FOWLS

Our fowls descend from the red jungle-fowl, a common game-bird in India and South-east Asia generally, which frequents woodland country, roosting in the trees at night, and during the rainy season frequenting them by day as well. It does not go far up the mountains and so never inhabits a cold climate.

We see, then, that to keep this bird's descendants comfortably and to get the best results they must have complete shelter available from Britain's colder and more changeable climate. Jungle-fowl can be kept free in Britain like pheasants, and thrive and breed well with only woodland shelter, but, of course, that is not the way to get many eggs or large chickens such as we desire from our tame birds.

The Fowl-house.—A fowl-house should be like a well-lighted room, with a hard floor and plenty of ventilation, but no draughts. Moderate sun is good, but shade is also essential, and the exposure should be chosen accordingly. The hardness of the floor is necessary for the sake of a thorough clean-out occasionally, but it should be well covered with litter such as straw, leaves, peat, chaff, etc., to the depth of six inches, especially if of wood, as a hard, uniform surface, exposed, is bad for fowls' feet, though a floor of slats is suitable for them.

Slatted-floor houses, however, are advisable only when the house is to be used solely for roosting, the birds being on free range where they may perhaps get natural shelter.

Such houses are raised a little off the ground, and the side space below the slatted floors should be filled up with netting to prevent vermin from getting in underneath at night.

This house can be moved from time to time to avoid fouling the ground below, and it is as well to have the ordinary solid-floor type of house movable if possible. Old buses and railway carriages have been found very useful houses.

The advantage of the house with littered solid floor, or scratching-shed as it is called, is that the fowls can be shut in it during bad weather and kept amused by scattering grain among the litter for them to rake out; and for a back-yard poultry keeper the scratching-shed will often be the only form of fowl accommodation possible.

In such a house the perch is placed above a shelf which is sprinkled with dry earth or ashes, and cleaned every day. The perch should not be more than six inches above the shelf, to keep the birds from trying to creep underneath, and both perch and shelf should be movable for thorough cleaning.

Perches and Nests. — Two-inch spars with the angles planed off, or poles of the thickness of a clothes-prop, are suitable for perches. A foot of perch-room should be allowed for each bird, and if there are more birds kept in the house than one perch

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

will hold, two must be put in and the shelf made broader; both perches must be on the same level or there will be squabbling for the top one. The shelf should not be more than a yard from the floor, and under it may be placed the nests, which can be movable boxes.

Hay or straw can be used for lining these. The lining must not be left in too long, lest it should become musty and taint the eggs. The whole house should be cleaned out weekly and lime-washed or creosoted once a year.

Floor Space required.—Unless the birds have free range, at least a square yard of floor space should be allowed to each in the house. When they can run outside not so much is needed, but the idea of using the house as a sort of hens' club room for bad weather should never be lost sight of, as the production of eggs in winter largely depends on the provision of such accommodation.

As fowls are not highly gregarious by nature, they do best in small groups; a cock and a breeding pen of hens, or a flock of layers of a dozen or two, form the best units. Two cocks must not be put in one house, and a cock is not needed at all where eggs are not wanted for hatching.

Since this last fact has been generally recognized there has been far less trouble with fowls' noises, for not only does the cock disturb the neighbourhood by crowing too often at night, but he encourages hens to cackle after laying by answering them.

The greatest care should be taken to keep the inside of the fowl-house free from damp, and the refuse daily scraped from under the perches; and the litter, when periodically removed, should be stored in a dry place till wanted as manure—wet takes away much of its strength.

Introducing a New Bird.—Any new bird should be introduced by being put on the perch at night; fowls are very blind and stupid then, and she will experience less hostility from her fellows next day than if she were put with them by daylight, when they can all recognize her as a stranger.

When such litter as peat-moss or sand is used, fowls will make their own dust-baths in it—for they practise this method of dry-cleaning instead of washing themselves.

Free Range—Better Eggs.—Free range solves many problems in poultry keeping, besides giving the birds opportunities for raw living animal and vegetable foods and exercise in procuring these items. The saving in feeding expense is considerable and the eggs are better to eat and more likely to hatch if fertilized.

The Enclosed Grass Run.—Next to this an enclosed grass run is best; about a quarter of an acre is needed for a couple of dozen birds, and the grass should be short and sweet, not long and coarse, when it is of little food value. An orchard is an excellent run for fowls, but there is danger of their robbing the small fruit bushes and devouring too many "windfalls."

The bigger the space the lower will the fence need to be to keep the birds in; but in a small run with no grass an eight-foot fence is needed for light breeds and a five-foot one for heavies. There should be no rail at the top to tempt the fowls to fly up and perch on it, and if the fence can be moved it is all the better, as it is a good plan to have two earth runs, one in occupation and the other dug and cultivated, the fowls being let into this when the crop is removed. They will then eat not only insects and worms, but chickweed, plantain and grass and clover; or a crop of rape may be grown specially for them to supply green food and cleanse the soil of manure.

Feeding.—Feeding in the case of birds on free range is very simple; one has only to throw them some corn morning and evening, taking care to stop giving any as soon as some of the birds turn away, and not to throw it constantly on the same spot for fear of fouling. Any scraps thrown to them must be given at regular times with, or instead of, the grain, so as to encourage them to go foraging for themselves and not hang about waiting for casual doles.

Birds in runs or scratching-sheds will need one meal a day of corn and one of mash. The mash must be fed to them in troughs, and should be of crumbly, not sloppy, consistency. It should be made of the coarse meals known as "sharps," "specks," etc., wetted with liquor in which house scraps, masts, vegetables, etc., have been boiled, and with the scraps themselves incorporated if of a nature to be easily mashed up. Bunches of carrot- and turnip-tops should be suspended from the fence.

An excess of fatty or salty food is to be avoided, and if there is a shortage of animal scraps some rough meat or fish scraps should be added twice a week. Care must be taken that this does not go in lumps, as a hen in this case may get too much, and when thus suffering from a surfeit of meat is likely to lay a soft egg, which encourages egg-eating. As a precaution against this vice, too, no egg-shells should be thrown out among scraps.

The mash must be kept before the fowls about a quarter of an hour and then any that is left removed. It is usual nowadays to give it in the evening, but as good results were got when morning mash-feeding was the custom, it is really rather a matter of the owner's convenience.

The corn should be thrown among the litter, where the birds can get exercise by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

scratching it out; a little experience will show how much is required. A change can be given by using one sort of grain one week and another the next. Wheat, barley, buckwheat and dari offer a good variety; maize should be used sparingly, especially with heavy breeds, and given mostly in cold weather, as it is fattening.

In cold weather, too, even birds on free range will be better for a daily meal of hot mash, and for having their corn rations given among litter in the indoor house, and at such times some animal food may be allowed them, as little is to be got outside.

Green food should always be before birds confined in scratching-sheds and earth runs; seeding lettuces and cabbages may well be utilized in this way. The food should be tied up in a bunch or hung in a net so that the birds can peck at it without fouling it. In winter, when greens are hard to get, a swede or turnip cut in half and fixed with the cut surface upmost should be given.

Grit.—Fowls need grit to help them to digest their food, and shell to form their egg-shells, so a supply of grit and crushed shell—flour grit and crushed oyster-shell are best—should always be at their disposal in a box covered at the top but open at the side. In a scratching-shed, where the supply is particularly essential, this should be placed on a small platform, like a couple of bricks, to keep litter from being scratched into it. An addition of calcium to the food also works wonders.

Water. — The water-vessel should be raised when water is given indoors, but wherever placed this supply should be kept in the shade, and the container, of the fountain type, should be of a pattern which takes apart so as to allow of a thorough scouring. Water should be given fresh every day, of course.

Sometimes food is kept constantly in front of the birds in the form of dry mash supplied in hoppers; this means a great saving of labour, and the birds have a difficulty in over-eating, as they cannot take too much of the dry mixture at once. A blended meal, sold for the purpose, is to be recommended for this, but wet mash is still relied upon by many.

To recapitulate: the great essential in housing is complete protection against damp and draughts, scorching and darkness; and in feeding the avoidance of excess and the maintenance of a green ration, while exercise is found in the getting of food; due supply of animal items must be given, especially in winter. For scratching-sheds an ingenious machine can be bought which scatters a few grains of corn whenever birds peck at a part of the mechanism.

Eggs and Breeding.—In Great Britain fowls are of importance in that they not only supply us with eggs but are also bred as table birds.

In regard to eggs, it should be fully realized that the colour of an egg is of no importance — a brown egg, in spite of popular ideas and prices, is no better than a white one inside. Eggs are supposed to weigh two ounces or a bit over, but while this is all very well for sale the most essential thing is that the supply should be regular all the year round, and that the shells should be strong and the yolks rich. Anæmic yolks and annoyingly brittle shells are far too common and are no recommendation.

Judicious attention to diet and shelter will help to keep eggs of good quality and constant in amount, but care must be taken that hens are not too old. Their first two years are the best for laying, and it is advisable to have half the stock yearling pullets and the other half birds in their second year. A hen that has done well in the second year, equalling the output of her first, should be kept for breeding if this is to be engaged in.

A good performance is 200 eggs per bird a year, and this is about as much as can be expected for a number of birds, though extra-good birds here and there may produce nearly half as many again.

Laying ability, curiously enough, is passed on by the male parent—it is more important that the cock in a breeding-pen should be the son of a good layer than that his mates should be the daughters of such.

The mate of second- or third-year hens should be a yearling cockerel, that of pullets in their first year an older bird; but three years is usually the limit of the male's usefulness.

The number of hens to be mated with a cock varies according to circumstances, the largest number allowable being in the case of a young light-breed bird in warm weather, to whom a dozen may be allowed, while an elderly heavy bird in cold weather should not have more than half as many mates.

Curing the Broody Hen.—In spring and summer many hens will, of course, go broody, and show this by remaining on the nest at night instead of perching. If they are not required to sit, as soon as this trick is observed they should be placed in a slatted coop raised on legs, so that they are always perching with air circulating under them and cannot imagine they are brooding. They should be fed on grain and green food and put where they can see the other birds, which treatment will result in breaking off the desire to sit in a week or so. As long, however, as the hen clucks

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and goes about with feathers bristling, she still wants to sit.

It may be as well to let a bird of the sitting disposition sit once a year. Most of the light breeds, if pure-bred, will seldom go broody, though cross-breeds, even of light varieties, revert to the primitive instinct and show broodiness.

Setting Eggs.—As some hens, especially young ones or those belonging to a breed which should be non-sitting, will at times sit for a few days and then give up, thus perhaps wasting a good clutch of eggs, an apparent broody, if her character is unknown, should be given a few dummy eggs to sit on for three days; meanwhile, any eggs that are to be procured from a distance can be got, and in any case her sitting quarters can be made ready.

These should be a box or coop, weather-proof and with the earth as a floor, and a small run, for it is essential that a sitter should have a place to herself away from other fowls. The nest should be made in the coop, of hay or straw on the ground, and a space left for a dust-bath in the run, under cover. The only food needed will be grain with, of course, drinking water.

Eggs procured from a distance should be "rested" for half a day before being put in the broody's nest, and she should be introduced to them just before dusk. All the attention she will then require will be feeding and watering daily, and a look at the nest when she comes off to see if any of the eggs are broken. If there has been such an accident, the rest must be washed in warm water and dried, and a new nest made.

Eggs are best set as fresh as possible, but may be kept hatchable even for a month by putting them in bran and turning them daily.

The eggs should hatch on the twenty-first day after being set, but circumstances may make them a little earlier or later, the chickens need not be looked to till the day after, as they need no food at first, the bowels being full of yolk.

A sitting is twelve or thirteen eggs, but so many large eggs should not be given to a small hen, lest she prove unable to cover them, in which case they will all get chilled in turn as she moves them about in the course of incubation.

It is noticeable that when a hen running at large "steals her nest"—that is to say, conceals it in a hedge, etc., like a wild bird—she is practically always successful in bringing off a full brood of strong chickens, supposing that she and her eggs escape the attentions of vermin. This shows plainly how privacy and a natural site on the earth are advantageous for hatching.

Incubators.—Numberless chickens nowadays are reared by means of incubators, and if anyone wants to raise many, these machines have a great advantage over hens, but a quiet room or shed free from extremes of temperature is necessary for the lodgment of an incubator. Instructions for working are issued by the maker.

Chickens can be raised at any time of the year if shelter is available, but in practice the best and usual time is the spring. The heavy breeds should be hatched in March, as they need longer to grow, while the light ones can be left till a month or two later.

Battery Brooders. — Incubator-hatched chickens are generally reared in artificially warmed brooders, of which there are many on the market. What are called battery brooders are constructed in tiers, with wire floors over a dropping-tray to each and a trough for food outside. In these, chickens can be reared in numbers, but the system seems very unnatural as little exercise is possible, and the beginner had best trust to the old-fashioned coop-and-run method.

Owing to the fact that chicks need no food for their first day, and can keep each other warm if packed in shallow boxes, large numbers of them are now sold as "day-olds," to be brought up in a brooder or by a hen which has been sitting on dummy eggs—not necessarily for the full three weeks—and has the adopted chicks placed under her wings at night.

Putting Chicks under a Hen.—In putting chicks or eggs under a hen the object should always be held in such a way that if the bird pecks the blow falls on the back of the hand—which can be gloved if necessary—not on the fragile object contained in it. One does not, of course, give a hen more chicks than would hatch out from a full sitting—about a dozen.

For rearing, the ideal method is to let the hen range with her brood and scratch for natural food for them, but what with vermin and the rivalries of the hens, who have no mercy on each other's chicks, this is often impracticable.

How to Feed Chicks.—Much more food will have to be provided by hand when the chicks are thus penned up, and in any case they need special feeding when small. The first three days hard-boiled eggs chopped up fine and mixed with dry breadcrumbs will do well, and such eggs need often cost nothing if the general rule of non-interference with incubation be relaxed in favour of the plan of "candling," or looking at each egg in a dark place against a light at about the fifth day of incubation, be adopted. Some are pretty certain to be found "clear," or without the spidery-looking dark mass that shows the developing life within, and these clear eggs can be saved for the subsequent first feed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The chicks' food should be placed where larger fowls cannot get at it—in a wide-meshed case if not under the run—and chickens of different sizes should not be fed together. The soft food should be given in quantities sufficiently small for all to be eaten up at once, the meals being on the "little-and-often" principle; but some dry food can be left overnight for the chicks' breakfast.

As the birds grow, a mash like that recommended for the adults can be given, and larger grain gradually take the place of the small stuff, while the meals are fewer in the day. Water should be given in a fountain or in one of those earthen jars with concentric rings when the birds are small, to avoid soaking, and care should be taken that the hen can reach it.

At six weeks old the chicks will be feathered and the hen will leave them and go back to the flock. Care must be taken that at this age the chicks do not smother or overheat themselves by huddling together in the corner of a coop. It is best to put them in a house with perches.

Distinguishing Cockerels.—When fit to leave the hen the cockerels will be distinguishable in the light breeds by the larger size and redder colour of their combs. Heavy-breed cockerels are less precocious and inclined to develop plumage more slowly than their sisters. Some remain very heavy-looking for a long time, the ultimate sign of male sex being the development of pointed feathers on the lower back.

Cockerels of the light breeds should, unless intended for stock, be separated as soon as their sex can be made out, shut up in a run and fed on mash only, in which fat can be used, with the idea of killing them as soon as possible, as they will never make big birds.

Fattening.—The others can be allowed to run and grow till they are of good size, when they should be put up for fattening, like most of the hens that have completed their second year. A fattening coop has a slatted floor and is put on legs like the broody-breaking coop, but should have a blind over the front to keep the birds from seeing out. On being put in, they should be left unfed for about a day to get them really hungry, so that on their first meal being offered they will be ready for it, whereas, if offered food too soon after imprisonment, they would refuse it and so start badly.

Meals should then be given often and regularly, but food must not be left before the fatting birds. The food should be mash, mixed with milk if possible, and containing plenty of fat. Birds cannot stand fattening very long, and will be as plump as they are likely to get without hand-crammings—a tedious job—in a fortnight, so that they should not be shut up long in advance.

If space and convenience exist, it is better to separate the sexes in all young fowls; the cockerels so treated will not quarrel and get tough, especially if an old cock be put with them to keep order, which he will do by a natural police-instinct. Pullets, also, when kept away from the males, are less likely to come on to lay prematurely, a precocity which has several disadvantages—it checks growth in large breeds, results in undersized eggs and, worst of all, is apt to end in a pullet, after laying a good many, going into moult and stopping laying just when she ought to be taking up that duty for the winter.

Moulting. — When fowls are moulting, their rations must not be cut because they are not laying then, which will usually be the case, for they are growing new feathers if not making eggs; on the other hand, a state of fatness is very adverse to the good quick moult which is to be desired. Feathers should be cleared up and got rid of from the moulting birds' quarters, and the dust-bath attended to.

As about half the birds hatched are cockerels, it is as well that the curious phenomenon of sex-linkage comes to our aid to distinguish them at hatching, though this will generally involve the crossing of breed.

Sex-linkage exhibits itself in this way—a breed in which the colour is yellow, auburn or red of any shade in combination with black counts technically as a "gold," and when mated with a "silver"—a white bird touched up with black—will give chicks which follow the cock in colour if pullets, and the hens if cockerels. Thus, if the Brown Leghorn cock, which is black and red, like the Red Jungle-fowl, be mated to Light Sussex hens, which are white with black on the neck and tail, all the cockerels will hatch out pale yellow, while the pullets will be brown in the fluff.

When the mating of "cuckoo" or barred-grey birds with blacks has a similar result, the young take after the parents of the opposite sex. Thus in Leghorns, in which sex-linking can in this case be practised within the breed, which has both black and cuckoo varieties, a cuckoo cockerel with black hens will breed chickens which will hatch out grey if pullets and black if cockerels.

It may here be mentioned that the young of black breeds are marked below with primrose patches when young and that they show some white in their first feathering, which disappears later.

The objection to crossing breeds is that it deprives one of any advantage that may be gained by selling pure-bred eggs and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stock at prices considerably more than table value. Also, if cross-bred birds are bred from, variation in all directions sets in, and there is less distinction between lights and heavies. But crossing gives hardy and easily reared chicks, and anything, even a lot of mongrels, is better than birds bred from near relations. In breeding even pure-bred birds, at best two families should be kept, or fresh cockerels procured yearly from outside.

When Buying Birds.—In buying birds care should be taken to see that their faces and combs are bright red, indicating health, and especially that there is no moisture about eyes, beak or vent. The scales on the legs should fit together into a smooth surface; they should not project and cause roughness, which is a sign of age, and the spurs of the cocks should be short and blunt.

Of course some birds bear their age better than others. A hen of the game type, exhibited at the London Poultry Congress some years back, was said to be seventeen years old, and looked about as many months! But most fowls, if allowed to live so long, would be old at half that age, especially heavies. Jungle-fowl, if they can escape animals, are no doubt longer-lived than tame birds.

Breeds.—With regard to breeds, there are so many that only a few general remarks can be made here. The advantages of lights and heavies are fairly evenly balanced; the former weigh from 3 to 8 lb., have good-sized combs, slim bodies, compact plumage and large tails.

They are the best all-round layers, and non-broody, the eggs being usually white; they can provide a large proportion of their own food, and on free range or in confinement are not so liable to lay on fat as the heavies; but they are more nervous, more apt to fly over fences and, when males or superannuated hens, are not readily saleable.

The flying can sometimes be stopped by cutting the first dozen quill-feathers of one wing at about the middle of their length; this must of course be done afresh, often every month, but causes no pain or disfigurement—the folding of the wing conceals the clipped quills.

On the other hand, nothing can make the heavies, which weigh from 6 to 10 lb., so light on their feet or such good foragers as the lights; they have smaller combs and quite short tails and wings and less compact form of plumage. They go broody and do not lay as well on the whole, but are more to be relied on for winter laying; their eggs are tinted. If cockerels or old hens, they are always saleable on account of their size. They nearly all have Cochin or Brahma blood, Cochins or Brahmas themselves being now rarer.

The best known of these is the Wyandotte, the only one which has a rose-comb—like a piece of coral—the other heavies being single-combed.

The best known of the lights is the Leghorn, distinguished by its large single comb, which falls over in the hen. It has for long been the best laying breed, but is small and scraggy on the table.

A good table fowl is the Dorking, which combines size and quality in a manner unknown in most others, and has proved most valuable as a cross; pure-bred it is not good enough as a layer and not adaptable enough to be generally popular, but has always held its own while other birds have risen and fallen. It has an extra hind toe on each foot, which has been a point of the breed since the beginning of our era, making it the oldest known.

In size and habits it resembles the heavies, but in combs, wings and tail the lights, and possibly a cross between Leghorn cocks and Dorking hens might give us a more useful all-round fowl than any now known, while, as there are cuckoos, reds and whites in both breeds, a blend could be effected without even disturbing the colour, if necessary, while hardihood would result from such a cross.

GEESE

THESE are the oldest of all domesticated birds, the common kind having been kept by the ancient Egyptians. They come from the grey-leg goose, which still breeds in remote parts of the Highlands and arrives here in some numbers in winter. It is grey in colour, alike in both sexes, with pale bill and feet, and feeds on grass, young corn, etc.; it is wary and gregarious.

Some geese are generally pied and often all white; if they belong to no particular breed the all-white birds are generally ganders, the pied and grey ones geese, but in the specialized breeds both sexes are either grey or white and the gander is hard to distinguish.

Long-lived Birds.—The best marks are his higher voice, fuller build and more independent manner. He should not be mated to more than three geese and the group should be put together before Christmas, as they take time to get used to each other. Once mated they will go on breeding for many years, being very long-lived birds, but old ganders are often vicious.

Feeding.—Geese live on grass, and are not worth keeping unless they can have grazing all the year round; but given this grass, of which they will eat as much as a sheep, they can be kept going for next to nothing for a large part of the year. When

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

food is given it need only be soaked stale bread, potatoes, bran mash and so on, though they will eat corn. They do not eat animal food and cannot claim to be vermin destroyers, but they clear off coarse grass and buttercups, and so improve bad pasture; they are best kept off that which is in prime condition and wanted for four-footed stock.

A goose will usually lay only one sitting before becoming broody; she sits thirty days and if she is the gander's favourite mate he will energetically resent any disturbance of her.

Goslings.—Goslings must not be allowed on a board floor, as they are liable to slip and sprain their legs thereon. Feeding as they do on grass from the first, though they will welcome the artificial items above-mentioned, they are usually allowed to go loose with the parents and in fact, if there is a pond on which they can, if necessary, seek safety from foxes at night, a family of geese can be left to themselves all the summer till the time comes to collect the year's goslings or "green geese" for Michaelmas, when such birds are in season. Yearling geese, by the way, can be recognized by having the feathers rounded as in ordinary birds, whereas in old geese they are square-cut as in turkeys.

No Housing required.—Geese need no housing and, if safety from vermin is not to be taken into account, can do without a pond, a drinking supply being, at a pinch, enough, though they also appreciate a bath. But they do not stay on the water as ducks so often do.

Geese for Christmas should receive plenty of mash and are always in demand, though before the Second World War they suffered from the rivalry of turkeys.

Goose eggs are excellent for cooking, and the light-built white Roman geese are said to lay as many as a hundred in a year. The large, heavy, grey Toulouse geese also lay a good many and do not go broody. Goose eggs can be hatched by large hens or by turkeys if necessary.

The black-billed brown Chinese geese so frequently seen in parks are the common tame geese of Asia, and are descended from the swan-goose of that continent. Chinese geese are sometimes also white with orange bills, but can always be distinguished from common geese by the much longer and smoother neck, higher voice, and generally by a knob on the forehead, which is larger on the gander and absent at first in the young.

They lay better than common geese, and do not get so rich and greasy, while in spite of the distinctness of species, the hybrids between the two are completely fertile. The two kinds live together so readily that crossing is almost certain where both are kept on the same range. The hybrid geese reproduce offspring like themselves, there being none of the "breaking up" in the second generation which we have seen takes place when two breeds of the same species are crossed.

It would thus be possible to start a new breed of hybrid geese at once if required, and as, although the best Chinese geese lay better than the best European, their eggs are smaller, an ideal laying breed might be formed by crossing Chinese and Roman geese. But possibly the first result of the cross might be to lessen the numbers of eggs by reversion to the wild type.

Geese can be herded and are well known to be excellent sentinels and are also useful in keeping the grass short in fowl runs. The Chinese species is never seen at poulterers, but is certainly more suitable for household use or private sale, being less coarse than the ordinary kind, while its popularity in public parks enables anyone to study the habits of geese, which are certainly the easiest and cheapest of all poultry to maintain, provided only that pasturage is available.

TURKEYS

THE turkey, in spite of its name, is a North American bird by origin, and was once very common in the wild state, ranging from southern Canada to Mexico, where it had been domesticated by the natives long before the coming of the white man.

It is a woodland omnivorous bird like the wild fowl but is, as may be inferred from what has been said above, a denizen of a temperate climate and is far more gregarious. In its days of abundance large flocks used to assemble in autumn and migrate long distances on foot in search of acorns, nuts and other forest produce, roosting in the trees at night.

Tame turkeys have remained remarkably like wild ones; their large size is not due to cultivation by man, for the wild bird can equal the greatest weights the tame one can attain to. It is noticeable in the case of both that the cock is half as large again as the hen, although there is little difference in plumage between them, except for the much greater development of the curious beard of bristles on the "gobbler's" breast.

Turkeys mature very quickly in size and plumage for such big birds, the yearlings at Christmas being very like adults, but they have still a lot of weight to make up. They should not be bred from, if kept for stock, the next year but the year following; while they can be kept on as breeders for much longer than fowls and at little expense, provided they have a free range, for they feed much on herbs and are splendid

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

foragers. Wild turkeys, like jungle fowl, are allowed to live as wild birds on some private estates, and breed well; the more the tame stockbirds are allowed to live a wild life, the better they will thrive. A feed of grain a day, and a frame of poles to roost on if there are no trees handy, are all they need.

Housing is unnecessary unless foxes are to be feared, and if a house be needed, the whole front of it must be wire-netting to give the maximum amount of air. The perches must also be stout and the nests large.

A gobbler can be run with up to a dozen hens, but if only a few birds are wanted it is sufficient to keep a hen or two and make arrangements for them to visit a neighbour's male bird when pairing begins, for with the turkey one pairing fertilizes the whole sitting.

As a rule a turkey-hen becomes broody after laying a dozen eggs or so, but a few will go on laying all through the spring and summer; such birds are valuable and should be kept for breeding, for turkey eggs are not only big but are very good eating indeed. The red or buff breed of turkeys are said to lay freely, as quite a regular thing, and so deserve patronage.

The trouble connected with turkey-raising is the delicacy of the chicks, though some people can rear them as well as young fowls. In addition to not breeding from too young stock, breeding between relatives must be strictly avoided, and the most compact and tight-feathered birds chosen, this being of more importance than size, though undersized birds should also be avoided. Twenty pounds for a cock and fifteen for a hen are big enough, and birds of this size or less are what are usually sold, though it must be admitted that monsters of thirty pounds or over will fetch a bigger price per pound, for use in hotels and clubs.

Care of young Turkeys.—The incubation period is four weeks; over this chicks or "poults" when hatched are less lively than fowl chicks and do not pick up so readily at first, though they soon become good foragers. They can be allowed to range with the hen, but there must be facilities for driving them under cover if it rains, as wet is fatal to them.

Their food is much more expensive than that of fowl chickens, for such mixtures as egg and bread, and bread and milk, have to be continued for weeks instead of days, while corn must be introduced only by degrees. Bitter herbs like chopped dandelion and seeding lettuce are valuable additions to the food and should be given from the first. At two months old the poults' heads become bare and red like those of old birds, and once this change has been safely got over they are hardy for the rest of their lives.

One great advantage about turkeys is that, though so like wild birds, they can be herded and driven by people and dogs like sheep, and thus moved about to where foraging is best for the time being. Thus, with a couple of full meals of mash a day the yearlings can be kept going steadily on till little, if any, finishing off is required at Christmas, when numberless families, who during the rest of the year never buy poultry, feel that they must have a turkey, and home supplies can never fill the demand, though British birds are admittedly best.

One great stimulus to the production of turkeys on the Continent is the prevalence of insect life and the utility of these birds in destroying this and incidentally cheapening their own keep, while performing this extremely useful function for the farmer.

BEE-KEEPING

FROM the earliest times bees, honey and wax have been mentioned by writers.

The Bible refers to them, and there is an ancient Egyptian hieroglyphic which signifies a bee. The philosopher Aristotle, Virgil the poet, and the naturalist Pliny write of the insect; in fact, Virgil's 4th Georgic is a book on bee-keeping.

The Israelites were encouraged by thoughts of a land flowing with milk and honey. Mead, the fermented liquor of the Anglo-Saxons, was made by dissolving honey in boiling water and adding malt and toast dipped in yeast. The busy bee was the emblem of Napoleon.

Although the science of bee-keeping is of such antiquity, and goes back into the dim past, it is only of late years that it has developed into an interesting and scientific hobby or occupation for men and women.

Modern bee-keeping may be said to have been inaugurated in 1841 by a Russian named Prokopovitsch, who suggested a hive with a top chamber for surplus honey and movable frames for the breeding combs. Before the advent of this method bees were hived in straw skeps, and when

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the honey was taken the bees were smoked out with brimstone, which was both cruel and wasteful. Ten years later the frames were perfected by an American clergyman, the Rev. L. L. Langstroth. They are the basic designs of our hive today.

Another great advance in the production of honey was the invention of Mehring, a Bavarian carpenter, in 1865. It took the form of thin sheets of wax stamped with the design of comb cells, which saves the time and labour of the bees in producing the wax. All they have to do is to build up the cells from this base.

Many other appliances were introduced which proved of great service in the development of practical bee-keeping, including the smoker, the idea of an American.

The thin wood sections, each capable of holding about one pound of honey, are now manufactured by the million. They make the handling and sale of honey easy. Another little apparatus, called the super-clearer, works almost automatically and allows the honey sections to be removed with very small chance of annoying the bees or being annoyed by them.

Bees may be kept almost anywhere other than in the heart of a great city. There is a hive in Reading Museum, the bees going out and returning through a hole cut in a plate glass window, and a surplus of honey is taken each year.

Many tons of honey in its raw state are lying about the countryside for us. By means of the bees it is gathered and manufactured into a delicacy for us in return for a home and a little attention. In addition, if fruit trees are growing in the garden bees will help in the fertilization of the bloom.

With regard to the value of fertilization of flowers by bees, Darwin experimented with forty heads of white clover, a great favourite with bees. The twenty heads that were visited by the bees produced nearly 3,000 seeds; those unvisited were seedless.

The prospective bee-keeper should advance step by step and gain a certain amount of practical experience before he starts his own colony or hives.

The old-fashioned and wasteful straw skeps already mentioned have been replaced by the modern hive. Although the outside designs may differ, the interiors are practically similar. They are made in such a way nowadays that the bee-keeper is able to purchase ready-made the comb frames and honey sections. A well-built hive is most important. It has to stand out in the open in all weathers. Choose one of simple design, good wood and, above all, good workmanship. The outside should have at least two coats of good paint. The roof must be kept always really waterproof.

Having chosen his hive the prospective bee-keeper will find that the exterior consists of a floorboard supported by four legs, some movable lifts, the lower of which contains the bees' entrance—the size of the opening being regulated by two movable strips of wood—and the roof. Great attention should be paid to the fitting of the various parts. There must be no crevices, so that rain and snow may be excluded from the hive.

Inside the hive, resting on the floorboard, is the brood chamber, which usually contains ten standard frames. These are fitted with sheets of pure beeswax impressed with the shape of the cells, the wax being strengthened by fine wires, the result being straight-built combs securely fastened in.

These frames hang free in the brood chamber. The top bar of the frame, being longer than the width of the brood chamber, rests on a ledge, and to ensure correct space between the combs, and to allow $\frac{1}{4}$ in. space between the outside of the frame and the wall of the brood chamber, the ends are fitted with a metal spacing-cap.

If the frames were closer than $\frac{1}{4}$ in. to the walls of the brood chamber the bees might fill the space with a cement called propolis, which is used by them for sealing up crevices; if the space is greater than $\frac{1}{4}$ in. they will fill it up with comb, making the removal of the frames very tedious.

The space at the bottom of the frames is usually $\frac{3}{8}$ in. to allow for the outgoing and incoming bees to pass. To facilitate removal of the frames, some bee-keepers use a dummy board at the end, which, being removed first, permits space for manœuvre.

Placed on top of these frames is a sheet of perforated metal called a queen excluder. The perforations in it allow worker bees to pass through, but the queen bee is too big and the combs in this chamber are used for laying her eggs, rearing her family and storing the honey for the winter food. The honey in these frames should never be removed.

The next section of the hive, called a super, contains a set of frames which are not so deep as those in the brood chamber, and are used for storing honey for the bee-keeper.

The third section, or second super, may contain what is called a section rack. In this there are twenty-one thin wood boxes, each with a square piece of wax foundation in it. Each of these sections will hold about 1 lb. of honey, the lines of sections being separated by a metal division. The top of the section rack is covered over with a piece of blanket material. Above

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

this is the roof. It contains two brass cone ventilators, which enable any bee to escape from the top of the hive.

The hive should face south or south-east to protect the bees from the cold winds. A good position is beside, but not under, a fruit tree. If near a pathway, the pathway should be at the rear of the hive. All work connected with the hive should be done from the back. Bees do not like being hindered in their flight to and from the hive, and a clear and open space should be kept in front of it.

A colony, as it is called, contains three kinds of bee, the queen, workers and drones in the proportion of one queen, 20,000 to 100,000 workers, and several hundreds of drones. In length the queen is the largest. She has a long body, and spends her life in laying eggs at up to 2,000 a day in summer. Drones are the next largest, and are of the male sex. They do no work nor take any part in the routine of the colony. They exist only to supply one of their number as a husband for the queen. When the marriage is consummated and the honey flow is finished, they are either killed by the workers or driven from the hive.

The workers are the ruling section of the colony. They are undeveloped females, and undertake the whole of the work required in the hive. Each has its particular job. Some workers are attendants on the queen, some gather food, some are nurses and care for the young brood when they are hatched from the eggs, others attend to the ventilation and cleanliness of the hive, some guard it from intruders.

Stocking a Hive.—The best time to stock a hive is in the spring. There are three methods of doing this, viz., by buying (1) a colony, (2) a nucleus, (3) a swarm.

By the purchase of a colony the hive is fully stocked, the combs have been built up, the young brood is being reared, and by the end of the season there may be a surplus of honey for the beekeeper.

A nucleus consists of four or more combs, two of which contain food honey only, so that there will be only two combs of bees. These will have to work hard during the honey flow to gather sufficient honey for their winter food, there being less chance of a surplus of honey.

The third method of stocking the hive is perhaps the best and cheapest way for the tyro. A swarm may sometimes be bought by weight. One pound of bees usually contains about 5,000 individuals. A good strong swarm should weigh about five pounds. Should the weather prove kind, a swarm will establish itself during the season.

On the arrival of the swarm the box containing the bees should be placed in the shade near the hive which is to be their home. The fastenings of the lid (usually screws) should be released, then the box turned gently upside down, the lid being wedged open by means of a small piece of wood ½ in. thick. If the bottom of the box has a perforated ventilator this should be covered with a cloth to exclude the light and prevent the bees from getting excited.

To make ready for the housing of the bees, a piece of three-ply wood the width of the alighting board on the hive, and of sufficient length to provide a gentle slope from the ground, is placed in position. This should be covered with a piece of cloth wider than the board so as to hang over the sides and prevent the bees turning under the sloping board. All being ready for the hiving operation, the box containing the bees should be carried gently, mouth downwards, and the bees smartly jerked on to the sloping board. The bees, always having a tendency to go upwards, will march up the board. A watch may be kept to see that the queen enters with them into their new home. The best time for the transfer is between 6 and 7 p.m., summer time. Never keep the bees longer than necessary in their travelling box.

Transferring a Colony.—To transfer a colony or nucleus from its travelling box is quite simple. The bees will arrive on frames with combs containing honey and the young brood.

First remove from the hive the roof, the movable lifts, and any frames that may be in the brood chamber. Place the box containing the bees as near as possible to the hive, unfasten the lid and gently blow a few puffs of smoke from the smoker into the box. This will make the bees frightened and they will start to gorge honey and be less likely to sting.

A smoker is usually a metal cylinder tapering to a nozzle and containing a roll of corrugated paper or cardboard. This when lighted gives off a pungent smoke. The burning is helped by the miniature bellows on which the cylinder is mounted.

Now remove the lid and carefully transfer frames, holding them by the metal lugs and keeping them vertical, so that the wax does not break under the weight of the bees. The frames must be kept in the same order, with the ends of the frames facing the entrance to the hive. Any loose bees may be shaken on to the top. Replace the queen excluder on top of the frames, the holes to run at right angles to them, then cover up with the blanket and finally build up the outer walls of the hive.

When the bees are only a nucleus the space in the brood chamber should be made up with frames containing sheets of foundation wax, adding two at a time.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Feeding the Bees.—Where the hive has been peopled with a swarm a certain amount of care and attention will be required. The bees should be fed for at least a week with warm syrup. This is made of one pound of white cane sugar and three-quarters of a pint of water, heated over the fire until dissolved. The syrup is fed to the bees by means of a bottle feeder, which is a glass jar mounted on a stage with apertures punched in it; the number open for the bees to obtain the syrup is regulated by a small lever and dial.

The requisite number of holes opened for this feed is three. A hole must be cut in the blanket or quilt to fit the stage of the feeder so that the hole may be closed again when the feeder is not in use. The syrup should be given warm, and the quilt well tucked down; folded newspapers also may be used to keep the bees warm.

After they have settled down, usually about the second day, the hive should be inspected and the dummy board moved up so that the frames on which the bees are clustered are kept from the unused frames. As the bees build out the wax foundation into comb, add another of the unused frames.

A word or two regarding the handling of the bees. No work in this connection should be hurried; everything should be done slowly and with sureness in oneself. The bees will detect at once any beekeeper who gets flurried and lacks confidence in himself.

A veil to protect the face should always be worn. The coat arms should be tied at the wrist to prevent bees from climbing up the sleeves and, if preferred, thin gloves may be worn. Never approach the hive from the front; always work from the back. First lift the roof from the hive, taking care not to jar it, then raise a corner of the quilt and blow a few puffs of smoke from the smoker. The bees will start to gorge the honey and become easier to handle.

How to treat a Sting.—On no account open the hive on cold or wet days, nor when thunder is about, and never open the hive without cause. In the event of a sting remove the sting with a sterilized pocket knife. Do not grasp the sting, or more of the fluid will be pressed into the puncture. Wet the spot and rub with a piece of common washing soda, after which a dab of iodine will reduce any irritation.

Should a colony make a habit of stinging, a change of queen should be made, getting one from a known docile colony.

Spring is the time of flowers; the nectar of flowers is the raw material of honey, and spring is the most important time for bees and the bee-keeper. The section rack, with its twenty-one sections, must be prepared, each frame containing its sheet of wax foundation. All that is necessary to do is to take off the quilt and place the rack on top of the queen excluder, replacing the quilt on top of the section rack.

As the bees build out the wax into cells and fill them with honey a fresh rack should be fitted *under* the one that is being worked on, the tendency of bees being to work from the top downwards.

When the top rack is filled and the cells are covered over, it may be removed for the benefit of the beekeeper.

Swarming. — Should the hive become overcrowded with bees they form a number of queen cells. These may be easily distinguished by the size and shape. They look very much like an acorn. When they appear it will not be long before a part of the colony will depart in search of a new home. This split in the colony is known as swarming, and takes place after the queen cells are sealed.

The first intimation of the coming swarm is excitement among the bees. Great numbers of them fly around the hive, gradually rising higher and wider as more bees leave the hive. With them is the queen.

If they are not in the mood to fly far they will cluster in a pear-shape form, perhaps on the branch of a nearby tree. Should the bees leave the bee-keeper's own ground he must follow them to establish his ownership and right to take them.

As soon as they have finished clustering, the beekeeper, wearing his veil, etc., should place a box, with an easy-fitting lid or a piece of cloth to cover the top, under the cluster of bees and then shake them into it. If the majority of the bees are not shaken into the box at first, replace the lid or cloth and wait until the remainder have clustered again, then repeat the operation.

Of course a number of bees will still be flying around, but if the queen is in the box they will gradually settle on it. If it is certain that the queen is within, the box may be turned upside down with the usual half-inch space for the remaining bees to enter.

The box should not be left in the sun, as the temperature of the swarm is high. The box should be placed in the shade if possible, or covered with a white cloth.

Should the bees swarm on the trunk of a tree or post, place the box underneath the bees and proceed to brush them into it with a stiff feather, which is a useful tool for manipulating bees.

They should be hived as already mentioned, but, if possible, care should be taken to see that the queen enters the hive.

It is just as well, when the swarm is to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be hived near the spot where they swarmed, to throw a pail of water over the spot in order to remove the scent, otherwise the bees may return.

The original hive is now queenless, and will be so for some days. At the end of this time the new queens will be hatched, and it is the endeavour of the one first hatched to reach the cells of the unhatched queens and kill them. If she is unable to do this a second swarm or cast, as it is called, will issue out on the ninth day.

The Song of the Queen Bee.—If the bee-keeper listens carefully on the evening before a queen cell hatches he may hear the "song," or rather "peep, peep," of the queen bee.

To prevent swarming from a hive, inspection of the brood combs should be made every week and any queen cells that have been built should be cut out and perhaps an extra section rack fitted. An additional frame fitted with foundation should also be inserted into the centre of the brood combs, an end comb being removed. Despite these precautions, swarming may take place.

When preparing to swarm, the bees raid the honey stores to the extent of two days' rations. For this reason bees are contented and are, therefore, easily handled when swarming.

Now comes the question of the surplus honey. The combs in the twenty-one squares of the section rack should be well filled and weigh about a pound each. They are ready for home consumption and require no further preparation other than the cleaning off of all traces of propolis.

When they are for sale it is usual to cap them top and bottom with squares of glass held in position with fancy paper binding. These may be bought ready prepared for the purpose.

Extracting Honey.—The honey which is contained in the shallow frames should be taken out with an extractor, of which several efficient types are on the market. The comb is uncapped by means of a specially shaped knife, which must be kept warm with hot water so as not to tear the comb cells, care being taken that pieces of the capping do not fall on the comb.

The uncapped frame is then placed in the extractor, which takes the form of a metal cylinder in which a cage is revolved by means of a geared handle. The honey is removed by centrifugal force. There is also an extractor which works by suction. The empty combs should be returned to the hive later as required.

Another method is to uncap the cells and allow the honey to drain into a dish. This is a slow and wasteful process.

The quantity and quality of honey obtained from a hive during the season vary naturally with the weather and the surrounding country. An average is 60 lbs.

As the summer draws to a close the bee-keeper must start to make ready for the care of his little servants through the cold winter months. The hive should be opened to see that it is in a clean state. To be able to fend through the cold weather, the bees should be in good numbers so as to keep warm. Several brood combs should be well filled with honey and capped.

A strong colony will require at least twenty-five pounds of honey. In other words, there should be at least five well-filled frames, the average consumption being about 1½ ounces per day.

The full combs should not be left on the outside as the cold might cause the honey to candy and the bees would naturally cluster on the centre for warmth. It is therefore important to see that the full combs are well distributed from the centre of the brood chamber, those having the most at the centre and so in proportion until the outside ones are practically empty.

Additional Food for the Winter.—If there be the slightest doubt about the quantity of store honey not being sufficient to last through the winter, a cake of candy should be placed over the feeding hole in the quilt. This candy may be bought ready for use in glass-bottomed boxes or simply made at home.

See that the top of the brood chamber is well covered with two or three quilts and newspapers after all supers have been removed, to retain the requisite heat in the hive. The roof should be covered, and any side subjected to a cold wind protected.

Provided that there is plenty of honey in the combs the hive will not require to be opened until the coming year. A warm sunny day in May, when the bees are active, should be chosen. Open up the hive, inspect the combs as to quantity of store honey, and give them, in the evening, a bottle of syrup, which the bees will take down and store. Syrup-feeding is a fine tonic just before the honey flow starts.

A few words on one of the diseases to which bees are subject may be of help to the prospective beekeeper.

When purchasing bees the beekeeper should obtain from the seller a guarantee that they are free from disease.

Acarine disease is caused by a parasite mite known as *Acarapis woodi Rennie*, which is found in the tracheal system of the bee. These mites feed on the blood and the bee gradually gets weaker and weaker, until such time as the victim falls off the alighting board and dies of exposure during the night. In very bad cases the entire colony will have to be destroyed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE HOME HANDYMAN

Practical Advice on Every Problem Connected with the Upkeep of a House

ARCHES AND TRELLISES.—The so-called "rustic" arch is an unsatisfactory object unless skilfully fashioned from carefully selected pieces. On the whole, arches built up out of straight pieces, or straight pieces bent to curves, are to be preferred. There are many possible and attractive designs for which ordinary battens and laths will suffice.

For posts, 2½-in. by 2½-in or 3-in. by 2-in. timber should be strong enough. Though pointed posts can be driven fairly easily, it is better to dig holes and bury their bases, as this course makes it possible to reinforce them at the bottom with boards having ample surface to resist strains. All underground parts, it is hardly necessary to add, should be thoroughly treated with preservative, if the arch is to have a long life.

An arch should be high enough to give 6 ft. 6 in. or 7 ft. of headroom; and there are distinct advantages in making it rigid and strong enough to lean a ladder against for the necessary operations of pruning and tying up whatever is trained over it.

Fig. 1 gives illustrations of four arches easy to construct. The first of these (Fig. 1*a*) has gables made by nailing a 2-in. by 2-in. batten near the top of each post, and connecting the two gables by 1-in. laths.

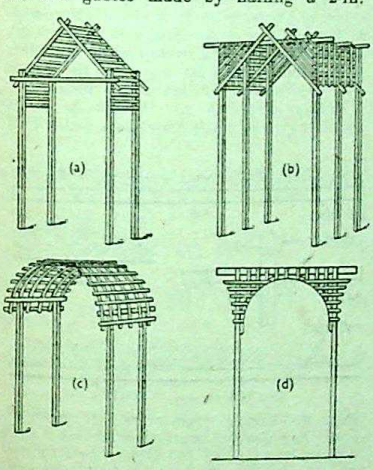


Fig. 1.—Four useful garden arches

The second sketch (Fig. 1*b*) shows a double arch which may be extended for any length as a pergola. The cross-pieces are here nailed to the tops of the posts, their ends extended several inches beyond each side. The gables are formed of battens.

In Fig. 1*c* we have an example of an arch with a semicircular top, formed of bent laths. When the posts have been fixed securely and the cross-pieces nailed on, battens are nailed from post to post about 4 in. below the cross-pieces. Sawn laths, ¼ in. thick and 1½ in. wide, made more lissom by being well soaked in water, are nailed at one end to the side of a batten, beyond which their ends project a few inches. They are then bent over and tucked under the other batten, and their other ends nailed.

When they have all been fixed, the cross laths are attached, beginning at the centre and working both ways. During nailing, the laths should be supported by something solid, such as a mallet or second hammer. All nails are clinched after being driven.

The fourth type of arch (Fig. 1*d*) has a curved crown of laths touching the underside of a cross-piece. The two frame parts are 14 in. apart and connected by laths or trellis-work.

A Strong Rose Arch.—Fig. 2 gives details of a very solid and rigid arch, which consists of two parallel frames of 3-in. by 2-in. battens held together by short crossbars in six places. It is stiffened laterally by four 2-in. by 2-in. struts, shortened at each end and fixed on the inside of the frames. The struts also act as supports for the trellis, which is carried up the sides and over the top, as indicated by heavy broken lines. It may be added that the trellis increases greatly the fore-and-aft stiffness of the arch.

The posts are 8 ft. 6 in. or 9 ft. long, to give a headroom of 6 ft. 6 in. or 7 ft. and allow for burying them to a depth of 2 ft. The top bars are notched to take the heads of the posts, which are cut off with a slight outward slope, so that the bars may throw off water. The two uprights and the two crossbars of a side are held together by 5-in. wire nails, for which holes have been bored in the posts.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

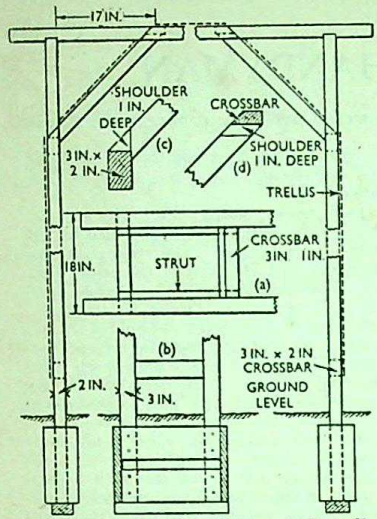


Fig 2.—Rose arch. Heavy broken line running round the outside indicates the position of the nailed-on trellis. (a) Detail of struts of one end of top (in plan). (b) Side view of bottom of side. (c) Detail of the bottom of a strut. (d) Detail of top of strut showing shoulder and crossbar

The stability of the posts is increased by the cross and vertical boards at the bottom, as shown in Fig. 2*b*. Details of the shoulders of the top and bottom of the struts appear on an enlarged scale in Figs. 2*c* and 2*d*. At its bottom end a strut rests on the upper crossbar of the side, and a shoulder 1 in. deep presses against the inside of the post.

The formation of the shoulder leaves a triangular tongue, which also helps to prevent the strut slipping, besides continuing the lower edge of the strut up the post. A similar shoulder is made at the top, which is 1 in. below the upper surface of the top bar, to give room for a crossbar 1 in. thick to be fitted in. One piece of this bar is bevelled to 45°, the raking angle of the struts.

In erecting the arch, begin by putting up the sides, after ramming hard the bottom of the holes in which they will stand. The top bars come in handy for keeping the sides the correct distance apart while the holes are partly filled. Then put the top bars in place, drive 4-in. nails a little way in to steady them, plumb the sides and test squareness of top angles. Temporary diagonals should be tacked on to prevent the arch "lozenging" while the struts are fitted and the top crossbars attached. Ramming can then be completed, the earth being brought up evenly all round to prevent displacement of the frames.

After two or three applications of creosote to all the visible woodwork, the trellis, creosoted beforehand, is nailed on. This can be bought ready-made to open to a width of 18 in. It should not extend quite to the outside corners of the posts.

The span of the arch will be governed by conditions. If it should exceed 6 ft., the struts may well be made longer than shown in Fig. 2.

Trellis.—The cheapest form of trellis is the diagonal expanding, which opens out into squares of 4 in. on the side. It is sold in lengths of 12 ft. when expanded, and in widths of up to 6 ft.

Trellis with vertical and horizontal members, spaced as described, can be made quickly by nailing together 1-in. by ¼-in. laths. It is more pleasing to the eye in many positions than the diagonal.

The trellis should be creosoted or painted before being put together, as the operation is carried out much more easily at this stage.

Brushing over diagonal trellis after piecing is a very tedious and wasteful job, and much time will be saved by the following method if creosote is to be used. Clean a corrugated iron roof and the gutters into which it discharges. Lay the trellis, closed, on the roof and pour creosote over it, catching the surplus in a vessel for re-use. A few minutes of flooding will do the work of hours of brushing over, and do it better, as the liquid finds its way into the places which cannot be reached with a brush.

Fixing Trellises to Walls.—A trellis should never be fixed direct to a wall. If it

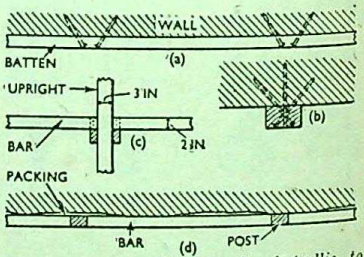


Fig. 3.—Fixing framework of trellis to wall. (a) Correct method of driving nails into mortar joints. (b) Batten held to wall by two skew nails and one straight nail. (c) Horizontal bars rest on fillets nailed to posts. (d) Packing is inserted behind the bars where the ends do not touch brickwork

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stands away an inch or two the fingers can get behind the slats, and tying becomes a much easier operation.

Where a trellis does not extend above the top of a wall, it may be attached to 2-in. by ¾-in. slating battens, nailed horizontally, 2 ft. or 2 ft. 6 in. apart. The proper method of driving the nails into the mortar joints is shown in Fig. 3*a*. "Dove-tailed" in this position, they get a much better hold than if driven in straight. In fact, a "straight" nail may have very little grip at all, if the mortar is friable.

Should the trellis project above the wall, it must be fastened to a framework, for which uprights of 3-in. by 2-in. stuff, and horizontals of 2-in. by 2-in. batten, are recommended. The uprights should extend 6 in. into the ground and be fixed first. They are held by groups of three 6-in. nails, one of each group being driven in straight first, to get the post plumb, and hold it so while the diagonal nails are driven above and below it (Fig. 3*b*).

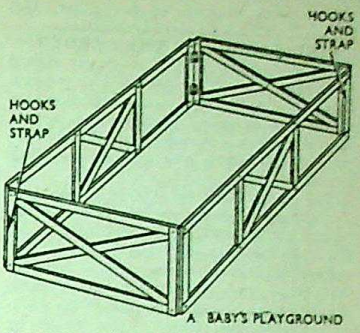
To ensure all the tops being level, the two end posts should be fixed first, and a string stretched tightly between their tops as a guide for the intermediate posts. A bar of 2-in. by 2-in. wood is then nailed along the tops, for the upper edge of the trellis to rest against. It may be covered by a capping-piece 3 in. wide, bevelled from the centre line to each edge, to shed rain.

The positions for horizontals which come between the posts are now marked. Fixing will be facilitated if a fillet is nailed to each side of a post for ends of abutting bars to rest on while being nailed (Fig. 3*c*). If the wall is somewhat roughly built, the bars may not touch it at the ends, in which case a packing-piece should be interposed, as in Fig. 3*d*, to keep the back flush with posts. Bars are attached to posts by nails driven in askew through the post and top.

The framework should be well creosoted before the trellis is attached, special attention being paid to the tops of the bars, on which water will tend to lodge. The posts should be so spaced that the lengths of trellis, when expanded to the depth desired, shall meet on the centre-lines of posts. To get a neat joint it is advisable to overlap the pieces slightly and cut both through with a tenon saw, down the centre-line.

BABY'S PLAYGROUND, A.—This is made out of sound slating battens, measuring 2 in. by ¾ in., carefully planed. It has sides 6 ft. long, ends 3 ft. long, and height all round of 18 in. As will be seen in the diagram, the ends are merely frames halved together at the corners, with diagonal struts, also halved at the crossing-point to give stiffness.

The sides are divided into three panels



A BABY'S PLAYGROUND

Appearance of completed baby's playground

by two uprights halved—or, much better, tenoned—into the top and bottom rails.

A side has an end hinged to it. For use, the free end of a side is hooked to the free end of an end, hooks and eyes being fitted for the purpose. The hooks may be reinforced by straps, to make things doubly secure.

The woodwork is put together with glue and screws and sandpapered all over to remove any splinters. The inside is then lined with towelling, attached by round-headed nails.

When not in use the apparatus is easily stored, as it folds into a small space.

BATH, RE-ENAMELLING A.—To make a thorough job, all the old paint should be cleaned off the inside surface and the metal be exposed completely. This operation can be carried through quickly with a painter's blow-lamp and scraper, though the heat may blister the paint on the outside and require it to be renewed.

An alternative is to apply one of the paint removers sold by oilmen, or brush on a strong solution of equal parts of washing soda and quicklime, until the enamel has softened sufficiently to be scraped off. When cleaned, the bath is well washed with water and allowed to dry. Rusty spots then require attention, since rust will prevent the enamel adhering permanently. After they have been well scraped and rubbed with emery cloth, a weak solution of sulphuric acid should be applied, followed by a vigorous rubbing with liquid ammonia and water.

Two or three coats of "flat" (non-glossy) undercoating, sold for the purpose, are put on, ample time being allowed between coats for thorough hardening. Bath enamel is used for the finishing coat. When this has set for twenty-four hours, fill the bath with cold water and leave it for a few days. The longer the enamel is allowed to harden

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

before being exposed to hot water, the longer it will keep in good condition.

BIRD TABLE FOR THE GARDEN.—The table shown in Fig. 1 stands rather more than 3 ft. off the ground. It is covered by a roof, so that the crumbs, etc., may not get sodden by rain. It also has a removable rim (this is shown on a reduced scale in Fig. 2*d*) which prevents crumbs being blown off.

The table itself is of ⅜-in. wood and 15 in. square. A square hole is cut in the centre for the upright, for which 2½-in. by 2½-in. stuff is very suitable. To secure and support it, two cross-pieces s s, of 2-in. by 1-in. wood, are screwed abreast to the table on the under side (Fig. 2*c*) *across* the grain of the table, and secured to the upright by stout screws. The distance from the table to the top of the upright is, in the case illustrated, 15½ in.

The roof is 21 in. square in plan. It is composed of two 21-in. by 12-in. pieces, making an angle of 120 degrees with one another. An inch from each end the roof is nailed to a triangular framework of 1-in. by ⅜-in. wood, the two side members of which are "halved" together at the top, while the cross-member is fixed behind them. The top of the post is shaped carefully to the angle of the roof. Cut two triangles of 1-in. stuff to fit inside the roof and screw these on to the roof at such a distance apart that the post fits tightly between them. The roof is secured to the post by a screw through each slope.

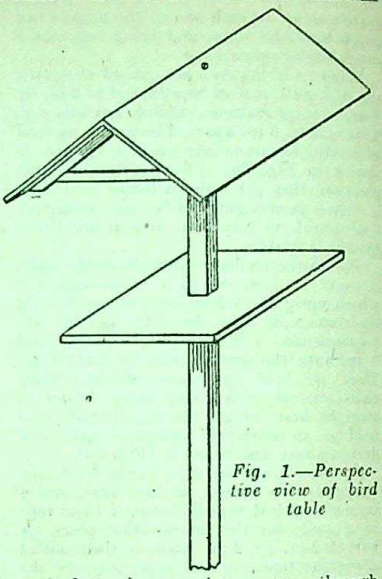


Fig. 1.—Perspective view of bird table

As the roof may be split by the combined action of rain and hot sun, it is advisable to cover it with some waterproof material.

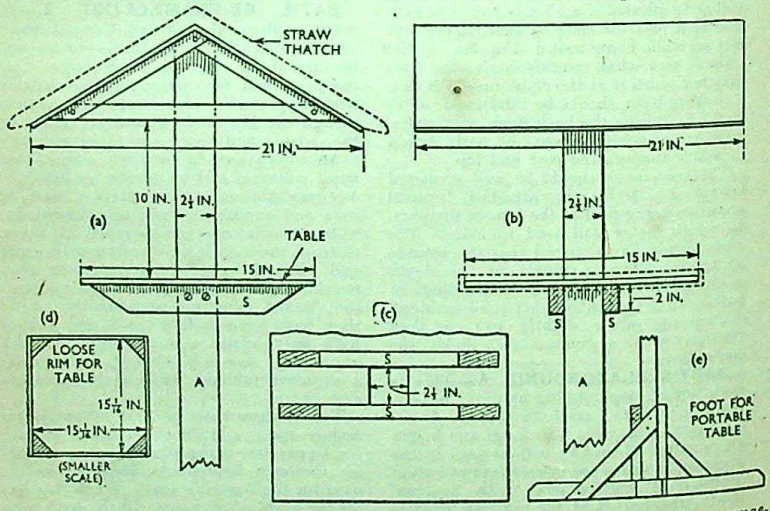


Fig. 2.—(a) End view of roof. (b) Side view. (c) Underside of table showing arrangement of the cross pieces. (d) Movable frame for surrounding table. (e) Details of the foot

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Zinc put on in one piece and turned up under the eaves will give very permanent protection. But a far more picturesque appearance results from the use of straw thatching an inch thick.

The straw should be long enough to reach right across. It can easily be secured by means of wires passing through three rows of eyes on each slope, one row near the eaves, one about half way up, and one near the pitch. The eyes must stand out about ⅜ in. and of course be turned edgeways to the direction of the slope. The ends of the wires should be bent downwards and secured under the roof, to keep the end straws in place. When the thatching is complete, the eaves are trimmed neatly with a pair of scissors.

The removable rim (Fig. 2*d*) is made of 1-in. by ½-in. stuff, held together at the corners by angle-pieces which also support it on the table. These pieces should allow the rim to project ½-in. above the top of the table.

If possible the post should be firmly embedded in the ground to a depth of at least 18 in. and, if a fixture is intended, allowance must be made for this and a pole 7 ft. long be obtained. If, however, a portable table is preferred, a post 5½ ft. long will suffice, but it must be provided with a foot such as is shown on a reduced scale in Fig. 2*e*.

This consists of two 30-in. pieces of 3-in. by 2-in. wood, "halved" together centrally to form a cross. At the point of crossing, a mortise or hole, 1½ in. square and 1 in. deep, is cut in the upper member; and a tenon to fit it closely is formed on the bottom of the post. Four braces of 2-in. by 1-in. wood hold the post to the cross.

The manner in which they are applied will be evident from Fig. 2*e*. It may be pointed out, however, that, as the arms of the cross are wider than the post, the bottom of each brace is "shouldered" to a depth of ¼ in., so that the brace may lie flat against both arm and post.

Paint the touching surfaces of the cross, mortise and tenon liberally before assembling the parts, to prevent water lodging. All the woodwork should be given two coats of creosote or paint.

BLINDS, VENETIAN.—When a cord breaks it is a simple matter to renew it if the top of the upper lath from which the blind is suspended is accessible to the hand. If this is not the case, the blind as a whole may be removed by undoing the screws which hold the top lath up against the window casing, or by dismounting it from the brackets on which it is supported at the ends, as the case may be.

Should the broken end project through the top lath, it may be used to draw a new cord into position. The new cord must be passed up through the holes in the laths—care being taken that the rungs of the tape ladder are alternately to right and left of it—and spliced on to the old cord neatly, so that there is no projection at the joint.

Assuming the break to be on the right-hand side, the old cord is hauled on till the new one has passed over the first pulley, and some slack is maintained while the old cord is drawing the new over the other two pulleys and down through the holes at the other ends of the slats. The end is then knotted under the bottom lath, and the slack on the right-hand side adjusted to give a hauling loop a yard or so long. The cord is then cut off and its other end knotted.

If the break is on the left side, the same procedure is followed in the opposite direction. The cord being in position, the blind is hauled up and the hauling loop knotted near the top.

Re-laddering.—If a ladder breaks at any point it is not worth while to attempt sewing it up, as rupture is generally due to old age. Both ladders should be renewed.

Let the blind down full, cut the knots at the ends of the cord and pull the cord out. The thin slats can now be drawn out of the ladders. The top lath is next released from the window-frame and the tapes are detached from the tilting and bottom laths and used as patterns when purchasing new ladders, which must have cross tapes of exactly the same spacing if the blind is to be of the original length when all the slats are used.

The ends of the new ladders having been attached to the laths, the cord is replaced on its pulleys and its ends temporarily knotted below the top fixed lath, which is then put back in place. The slats are introduced into the ladders and the cords run down through them and knotted at the ends.

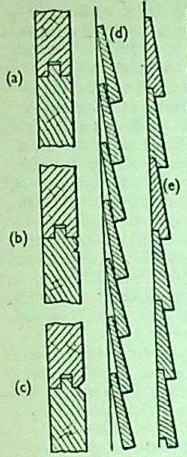
Cleaning and repairing laths.—When a blind is re-laddered, the pulleys should be oiled and the short tapes which run from the tilting lath over rollers in the top lath be renewed if they appear at all worn or perished, since they have to carry the whole weight of the blind.

Then, too, is the time to give the slats a scrubbing and, if they need it, a coating of the paint-varnish sold specially for the purpose. It is best to get rid of old paint by the use of a paint-remover, and to glass-paper the slats, or at least to smooth down the old paint, before repainting.

BOARDS.—Leaving boards with plain, square edges out of consideration, those most commonly used are generally known as matchboarding. A board of this class has a tongue formed on one edge and a groove cut in the other. The tongue and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



(a) Plain tongued and grooved matchboards. (b) Tongued, grooved and beaded matchboards. (c) V-grooved matchboards. (d) Ordinary weatherboards. (e) Rebated weatherboards

groove respectively fit into the groove of a similar board on one side and receive the tongue of a board on the other side.

If the boards are set up close to one another it is impossible for them to shrink sufficiently for the tongues to leave the grooves, so that the passage of air, dust or dirt is prevented effectively. The interlocking also helps to keep the boards in the same plane when fixed.

Three common types of matchboards are shown in the diagram. Where as unbroken a surface as possible is wanted—for floors, and lining roofs, for example—plain matchboarding shown in (*a*) is preferred. For covering sheds and for doors and for lining walls inside, matchboarding with some ornamentation would be selected; either the beaded (illustrated in *b*) or V-grooved (shown in *c*). The latter is more easy to paint at the joints.

All matchboards arranged horizontally and exposed to the weather must have their tongue edge upwards, as in the illustrations, so that there shall be no lodgment for water. It is obvious that if the tongues pointed downward every groove would become a receptacle for water.

Common weatherboarding or feather-edged boarding (illustrated in *d*) is much used, arranged horizontally, for covering the walls, and in some cases the roofs, of cottages and outbuildings. Larch is the best material for this boarding, which, if kept well tarred, creosoted or painted, will last for many years. Arranged vertically, it makes very good closed fencing.

For housework the rebated form (shown in *e*) is to be preferred on the score of neatness and ease of fixing, as it lies flat at the back, and one board need not be nailed through the other. Moreover, it requires less overlap and therefore has greater covering value, and the joints fit more snugly and so are more windproof.

BONFIRES.—For burning large quantities of garden rubbish there is nothing to beat the old-fashioned bonfire. The success of a bonfire depends on a strong heart of hot embers being established and on the heat which it gives out being prevented from escaping.

The material to be burned requires grading beforehand. Twigs and shrub trimmings should be stocked in one place and leaves, weeds, lawn mowings and other stuff which burns less readily in another. Branches, long twigs and large loppings will burn much more readily if first cut up into small pieces which will pack closely together.

If rain has fallen recently, it may be necessary to begin with a fire of kindling wood, arranged in pyramidal form around a centre of paper. Do not stint the wood if the rubbish promises to ignite unwillingly. When the wood is well ablaze, add the more combustible matter, a little at a time—encouraging it, if necessary, with a few occasional drops of paraffin oil, until it in turn is blazing well. Then the fire can be gradually covered in with green stuff, beginning at the bottom and working up to the top.

In the earlier stages the covering must not be thick, or it may smother the burning matter inside unduly and finally quench it. The important thing is to prevent the fire burning through at any point, which will be heralded by the material there turning dark.

At nightfall the bonfire is banked up with a sufficiency of slow-burning fuel to last till the morning. If the bonfire survives and is still going strongly, it will probably have enough reserve heat to deal with any amount of wet stuff, including even clay. The last, when thoroughly burned to redness and afterwards left to weather, is a very good fertilizer and lightener of the soil when mixed with vegetable ashes. But it should not be dug in while fresh.

A windy day is favourable for bonfires. But in towns care should be taken that the smoke is not blown in a direction which may make it a nuisance—on to a neighbour's washing, or through his windows, for example. Moreover, at night a smouldering bonfire may be noxious when there is no wind to blow the fumes away quickly.

BOXES, STRENGTHENING.—Boxes intended for rough work in the garden and elsewhere will last very much longer if a little work is done upon them before they are put into use.

Assume the box to be one of the familiar kind bearing the name of Tate. It will have two ledges inside at the ends, flush with the top, to hold the ends together. These are an obstruction to emptying the box of its contents by tipping, so they should be removed and replaced by ledges

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

inches across on the outside. These will be useful for lifting.

Now take a hammer and 1½-in. wire nails and drive nails in slantingly wherever extra nails seem needed to hold bottom, sides and ends together more securely. Then out of stout sheet zinc cut four pieces measuring 4 in. by 2 in. Trim off the corners and bend them half way along to a right angle. These, nailed to the outside ledges and the sides, will increase the box's strength greatly at the top.

Similar pieces should hold ends and sides together at the bottom, and bottom to sides and ends. All nails put through the angle-pieces should be long enough to clinch on the inside. A box reinforced in this way will stand years of rough usage.

BRICKWORK IN THE GARDEN.—Bricks can be used very effectively for garden paths, steps, paving, low walls, pedestals and other purposes.

Those which will be walked or barrowed over should be hard bricks and, if to be laid flat, must be "cut" bricks without hollows or frogs in their wide faces.

Red bricks are preferable to yellow, and if old ones in good condition can be obtained so much the better, as their weathered colour is much more pleasing than the raw tints of new bricks.

Bricks for paths or paving should be laid on well consolidated ground covered with a layer of ashes, rolled and levelled as thoroughly as is possible. Fine sand may be used for levelling up individual bricks and for filling the joints after the bricks have been laid.

The actual arrangement of the bricks, if it is not to be severely simple, should be planned very carefully beforehand, so as to fit in with the dimensions of the bricks used.

For a narrow path a very effective scheme is to have the centre of three or four widths of bricks laid endways in the direction of the path and breaking joint, that is, not having the joints of two adjacent courses in line, and to lay a single row of bricks along each side, at right angles to the centre bricks.

Circular spaces may be covered with bricks radiating from the centre, or with rings of bricks end to end alternating with rows of radial bricks. Herringbone patterns also are very effective.

Bricks on end make good edgings. Pressed bricks (with frogs), keyed together by cement mortar in the frogs, will prove very stable.

Walls may either be built "dry"—without mortar—or be cemented. In the first case it is advisable to give the wall a slight batter, or backward slope, keeping the earth behind level with the wall as it rises. Where cement mortar is used it should be darkened by mixing in a little vegetable black.

Steps should be laid with cement mortar, or be grouted in with semi-liquid cement after the bricks are in position. Grouting is also effective for paths and paving. The filling may be stopped half an inch or so below the surface, to allow the accumulation of a concealing layer of soil, etc.

BURGLARY, PROTECTION AGAINST.—The householder can protect himself definitely from losses by burglary and housebreaking only by proper insurance. The expert professional burglar is extremely hard to keep out, whatever precautions be taken. A great many burglaries, however, are committed by comparative amateurs, ready enough to take advantage of things being made easy for them but likely to be discouraged if they find that considerable difficulties have been put in their way, and a large proportion of these burglaries are due to windows and doors having been carelessly secured, or not secured at all, ladders left unchained near the house, and so on.

Again, fittings in which faith is placed may be very inadequate defences. A jemmy will make short work of bolts and rim-lock staples of the usually somewhat flimsy type, held on by small screws. The same remark applies to most window catches. Then again the doors of many outhouses have cross-garnet hinges which have merely to be unscrewed, and are secured by padlocks that yield easily to the twisting leverage of a bar.

From which it is evident that the box staples of rim locks on outer doors should be reinforced or replaced by staples of iron, fixed on with screws sunk deep into the door frame; that window catches should not be expected to stand a heavy strain: that exposed hinges should be held on by round-headed bolts with their nuts inside the door, and padlocks be replaced by locks.

The safety of sash windows is increased by catches which pull the two sashes together tightly, leaving no crack for the insertion of a knife or saw. The forcing up of a sash is made much more difficult if holes are bored in line through the top corners of the lower sash and the bottom corners of the upper to take stout iron pegs —shortened 6-in. wire nails do excellently.

Even if a sash be forced up, the burglar may still be foiled if he finds that slips have been screwed firmly to the upper sash, which prevent the lower being raised more than a few inches. An alternative to fixed stops—which may be inconvenient at times —is the removable stop screwing into a socket in the upper sash.

It must, however, be realized that the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

effectiveness of window protection depends largely on the glass remaining unbroken; and the same can be said of door bolts and locks close to glass panels. A night-latch operated from outside by an unpickable lock will prove harmless—from the burglar's point of view—if the removal of part of a glass panel will enable him to get his hand to the knob which draws back the latch.

For this reason it is advisable to have a good mortise dead-lock on a front door with glass panels, for use on occasions when the house is left empty, as any bolts on the inside cannot then be shot. It is a defect, by the by, of latticed windows that a small pane can easily be removed from its lead setting.

A bolt near the bottom of a glass-panelled door will give much more trouble than one at the top, being out of arm's reach. Speaking of bolts, preference should be given to those with handles which can be turned down against the door, where they are inaccessible to a stick.

Chains are very useful on outside doors to check any invader who may have forced the lock or bolts.

As regards inside doors, they too may well have bolts—preferably bolts of the kind which are mortised into the edge and turned by a knob outside the door. Locking and bolting all doors of an unoccupied house, or those of the ground floor and unused rooms on the first floor at night, may restrict the operations of anyone who has broken in through a window. When a house is to be vacated for a period—as for a holiday—the keys should be removed from the doors.

Electric Alarms.—The proper fitting of these and the concealment of the circuit wires are matters which had better be left to a professional electrician who has had special experience of such work. An adequate installation would include at least alarms to all outside doors and windows on the ground floor, and to windows of landings and first-floor rooms which are not bedrooms.

All alarms should be connected with an indicator, unless the house is a small one. The bell will be one of the continuous-action type, which will ring until switched off.

CASKS, USES FOR.—A beer or oil cask, after one end has been removed, is useful as a water-butt, or for storing grain and other chicken food. Cut in half, it serves as two magnified flowerpots for flowers or shrubs; or the halves may be sunk in the ground to grow water-lilies. Other uses could easily be thought of.

As casks for holding liquids are usually made of oak, they have a very long life if well looked after and not allowed to fall to pieces through the rusting of the hoops.

To remove the top of a cask, remove the end hoop and the one next it. To get a hoop loose, knock it up with a square-ended punch, working all round so that it moves evenly. It is replaced in the same way.

If the cask is to be used as a bin, the end should be preserved as a lid, having two crossbars nailed or screwed to the under side, so shaped that they centre it on the cask, and be provided with a handle.

An oil cask is cleaned by lighting a little straw or shavings inside it and rolling it about until it is charred all over inside, by which time most of the oil will have been burned out of it. To put the flames out, stand the cask on its open end. The loose charcoal is scraped off and the cask given a good scrubbing with soda and water followed by plain hot water.

To cut a cask in half, mark it all round from one end, taking the centre of the bung-hole as distance. Then follow the line with a saw until it has made a continuous groove, and keep on cutting and turning until the saw goes through.

A cask or tub should not be put into use out of doors until it has been painted thoroughly outside. The hoops require special attention; they should be removed in rotation and given two or three coats of paint (allowed to dry hard) inside before being replaced, and the cask should be painted under where they lie. When they are in position give two good coats all over. The hoops will then last a long time.

To provide for their eventual rusting through, the cask may be wrapped near the hoops with galvanized iron wire, pulled as tight as possible and stapled to the staves.

As it is undesirable that a water-butt should overflow down the sides, provide it near the top with an overflow pipe at least an inch in diameter and projecting six inches or more.

CHAIRS, WOBBLY. — If a chair wobbles badly, one of the two legs on which it wobbles needs shortening.

To find out which should be dealt with, cut four blocks out of the same piece of board and stand the chair on them. Remove the block from under one of the longer legs and put a weight near the other to keep it down on its block. Note how level the chair now is. Repeat the process with the other leg. Having decided on which three legs the chair is most level, scribe a mark round the fourth, using the block as gauge, and cut off to the mark. Wobbly tables are treated in the same way.

CINDER-SIFTER, A COVERED-IN.—Sifting cinders in the open is unpleasant and dusty work. Dustiness can be pre-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

vented by the expenditure of a little money and time.

A ½-in. mesh circular sieve, a few inches smaller in diameter than the ashcan, should be obtained; also a couple of yards of ⅛-in. iron wire. Two holes, large enough for the wire to pass through and 3 in. apart, are bored through the side of the sieve near the rim, at each end of a diameter. The wire is bent to form a parallel loop 3 in. across, and its ends passed through the holes, the end of the loop being allowed to project 8 in. or so to serve as handle.

The raw ends are turned over to form hooks an inch long and cut off, after which the wires are bent apart horizontally inside the sieve to prevent their moving.

For use, the sieve is laid in the ashcan with the hooks over the farther side, and filled with ashes. The cover having been replaced, the handle is shaken vigorously from side to side. The crack between cover and can, caused by the intervention of the handle, will not be large enough to allow an appreciable quantity of dust to escape.

CISTERN, JACKETING A HOT-WATER.—Excepting in cases where the hot-water cylinder or cistern is deliberately left bare so that heat from it may be used for airing clothes or warming a room, there are obvious advantages in retarding the cooling of its contents. A certain amount of fuel will be saved, and water which has once been well heated will keep hot a long time. If the jacketing is very thoroughly done, and no water be drawn off, the water may retain a high temperature even for days.

The smaller a cistern is, the more quickly does it part with its heat, since the radiating surface is larger in proportion to its contents. For example, a cubical tank 24 in. on the side, holding about 50 gallons of water, has 24 sq. ft. of surface—say ½ sq. ft. per gallon; whereas a tank 3 ft. on the side, holding 160 gallons, has 54 sq. ft. of surface, or about ⅓ sq. ft. to the gallon, and therefore would hold its heat longer than the smaller tank.

The hottest water in a cistern is always at the top, where it may even have reached boiling point though the water at the bottom is nearly cold. So radiation will be greatest at the top and decrease towards the bottom of the cistern, and the upper part of a tank, therefore, requires insulation most.

If the cistern is square-cornered and close to an angle of the walls, the two sides next the walls can be well insulated by stuffing cottonwool, wool, hair or other fibrous material into the spaces between the walls and cistern. This will imprison air which, next to complete absence of air, is the best of insulators if unable to move. Special care will be needed round the edges to avoid leakage.

The remaining sides and top, or all the sides if they are accessible, can be jacketed with boiler felt, ¾ in. or more thick, or failing this with old rugs or carpets with a long nap, the nap turned inwards. The covering is held up against the sides by bands tied very tightly round top and bottom. If a pipe comes in the way, a slit must be cut and enlarged to the size of the pipe in the right place.

To make a really neat job, and at the same time improve the insulation, a wooden casing of matchboarding may be constructed to fit outside the soft covering, an opening with cover being arranged opposite the manhole.

An alternative which gives good results and is easy to carry out is to use asbestos for the jacket. From 5 to 10 lb. of asbestos meal for every square foot of surface will be needed, according to the thickness of coating desired. (The bottom of the cistern may be left out of the calculation, as very little heat escapes through it.)

To prevent the walls being splashed during operations, pin paper on them, and spread a dust sheet or two on the floor.

Before application of the asbestos begins the cistern should be heated until it is as hot as the hand can bear, but it must not be allowed to become hotter than this. Then make a thin wash of asbestos and water, and brush the cistern—which is assumed not to be painted—over with it.

The meal should be spread out and all large lumps put aside to soak. The fine meal is then placed in a large bucket and mixed with sufficient water to form a fairly stiff paste. The mixing must be done thoroughly, as any material left dry may give trouble.

The sides of the cistern are now spattered all over with small pellets of the paste, flung with the hands or a square-ended paint scraper. These are left to dry on. In the process of drying, the asbestos becomes much whiter. The manhole, by the by, should not be covered, as breaking away any part of the insulation at a later date may cause the rest to crack and separate from the metal.

When the rough key coat is dry, a layer half an inch thick may be added with a round-nosed trowel. The surface should be left rather rough, to give a better hold to the succeeding layer. The final coating is smoothed down with the trowel, small quantities of paste being added to fill up any hollows.

If any asbestos remains over, use it on the top of the cistern, where it will be of most service. Round the asbestos off at all corners and taper it towards the manhole

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sharp edges are easily damaged and liable to crack.

The asbestos may be painted over to match the surroundings. A more secure job will be made if, before painting, coarse canvas is stuck to the asbestos with a liberal amount of flour-and-water paste. The asbestos will then be held permanently in place, whether it cracks or not. The canvas, when dry, may be given a coating or two of paint.

CLOCKS.—Pendulum clocks should be level in both directions, and more especially laterally. If the surface on which a clock stands is not level, the clock should be raised on the lower side, by wedges or slips of cardboard, until the pendulum, when at rest, is parallel to the sides and back.

The sound of the tick is a good guide to proper levelling. The ticks should be perfectly even in strength and duration. If the clock goes tick-*tock*, tick-*tock*, the pendulum is swinging too far in one direction and not far enough in the other.

A pendulum clock is regulated in most cases by means of a milled nut at the bottom of the shaft. Turning this in one direction raises the bob and makes the beats shorter in duration—and so speeds up the clock — while lowering the bob, by turning the nut in the other direction, slows the clock.

Some clocks have a gear at the top of the pendulum which is turned by a key and lowers or raises the pendulum as a whole. The "square" for the key projects through the face over the XII. Regulation should be done by small stages, the clock being allowed to run for a day or two after each setting.

The hands of a non-striking clock can be turned backwards, like those of a watch, without deranging the mechanism in any way. But a *striking clock* must not be put back beyond a striking-point—hour, half-hour or quarter-hour, as the case may be—as to do so would put the striking mechanism out of step with the time mechanism. Nor may it be put forward without being allowed to strike at each striking-point.

If a clock that strikes the hours only gets out of step, turn the minute hand to the hour, count the strokes, move the hour hand—which is usually loose on its spindle—to the hour struck, and then set the clock to the correct time, allowing it to strike at the hours.

If a half-hour striker takes to striking hours at half-hours, turn the minute hand past a striking-point without allowing the clock to strike, and then adjust the hour hand as already described.

The works of a clock can be *cleaned* without being taken to pieces, by removing them from the case, standing them in a clean tray, and squirting them with petrol (*not* paraffin). "Aviation" petrol is best for the purpose. (The petrol, if filtered through cottonwool, can be used again.) When the petrol on the works has evaporated, all spindle bearings should be lubricated with a little of the special oil used by watchmakers, applied with a sharp metal or wood point.

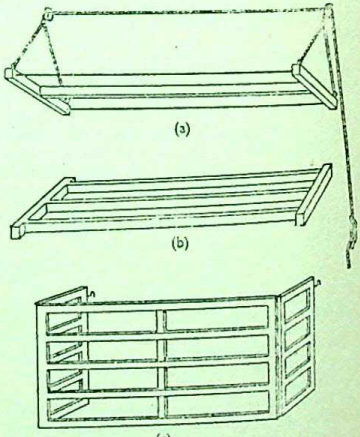
In winter the thickening of oil by cold may render a clock sulky, and it is worth while trying the effect of warming the clock in front of a fire, assuming it to have a metal case which will not be damaged by heat.

Electric-Mains Clocks.—The standardizing of the number of alternations per second of the current generated by the power stations of a country has brought into use a new type of electric clock which, if connected with the mains circuit of the house, will never need to be wound and will keep perfect time indefinitely.

The hands are moved by a tiny electric motor which is so constructed that it is bound to keep running at a rate controlled at the power station, where a standard time dial is periodically adjusted by signals from Greenwich.

These clocks are sold at very moderate prices and, where a public electric supply is available, do away with the need for expensive self-contained clocks.

CLOTHES DRIERS.—Two forms of easily made rack for hoisting clothes and



(a) Drying-rack for clothes with central wooden rod and two wire cables. (b) Another type with three wooden bars. (c) A combined wooden fireguard and clothes drier made out of planed slating battens

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

other articles to the kitchen ceiling are shown in the figures *a* and *b*. The first of these is really an H of 1½-in. by 1½-in. wood, with two stout galvanized wire cables parallel to the long member. The wires may be replaced by ¾-in. by 1½-in. battens, on edge, as in diagram *b*. For strength and appearance joints should be mortised and tenoned.

The combined guard and clothes-drier shown in diagram *c* is long and deep enough to go round an ordinary kerb, and 30 in. high. The ends are hinged to the front and provided with hooks for engaging with eyes in the wall outside the fireplace. Sound 2-in. by ⅞-in. slating battens, planed and rubbed down with glasspaper, will serve as material. The joints may be halved, but tenons and mortises will give a stronger and stouter article. All corners should be rounded off.

CLOTHES POSTS, MOVABLE.—At the best, clothes posts are not ornamental and in most gardens are a disfigurement, but the use of them may be unavoidable. There is therefore much to be said in favour of making them removable when not required. Each post will need a socket, say 30 in. deep, in which to be erected, buried firmly in the ground. The posts should be of 3-in. by 3-in. stuff, bought ready planed. Sockets to fit what will be their bottom ends may conveniently be built round these after cardboard strips have been temporarily stuck or tacked to two of their adjacent sides. This will ensure the sockets not being too close a fit and giving trouble if damp should cause swelling.

A socket is composed of two 30-in. strips of wood 1 in. thick and as wide as the thickness of the post, and two pieces 6 in. or 7 in. wide. The bottom is closed by a 12-in. length of the wider stuff, projecting equally both ways to make a foot. The parts must be fixed together very firmly by long nails or, preferably, screws. A cover for each socket is made out of a cap 5 in. square, bevelled four ways from the centre to shed rain, and attached to a plug.

Before being buried in the ground, a socket should be well soaked in creosote. The more thoroughly this is done, the longer will the woodwork last. The hole dug for a socket should be of such a depth that the top of the socket will project a couple of inches above the ground. If the socket be sunk flush, stones and dirt are certain to find their way in. Turn the socket so that its wider sides lie across the direction of the clothes line. A piece of 12-in. by 6-in. stuff, nailed across the side of the socket towards which it will be pulled by the tension of the line, and 4 in. below the top, will enable it to resist pull much better when this line is full of clothes.

To ensure the socket being vertical, insert the post and plumb it in both directions with the help of wires or cords running from the top to any handy fixed objects. The filling can then be proceeded with. Large stones and brickbats placed next the wood and rammed down well with the earth will increase stability.

For convenience of insertion and removal, each post may be provided with a pair of iron "strap" handles, placed at such a height that the post can easily be lifted clear of its socket.

CONCRETE PATH, LAYING A.—Gravel, ash, and earth paths have some serious disadvantages, even the first requiring weeding and being liable to become moss-grown and slippery. A concrete path keeps clean, is easy to run a barrow along, and forms a convenient platform for throwing earth, weeds, etc., on to, as it can quickly be cleaned with the spade or brush.

Artificial-stone makers supply slabs 2 in., 2½ in., or 3 in. thick and of such differing dimensions that a path 18 in., 24 in., 30 in., or 36 in. wide can be made by laying them side by side. As they are thoroughly seasoned and hard before sale, they give very satisfactory results if carefully laid on a correctly levelled surface.

A cheaper alternative is to form the path with concrete moulded *in situ*, subdividing it into 3-ft. or 4-ft. lengths, to permit easy expansion and contraction and so avoid the cracking which afflicts large areas of continuous concrete.

The illustrations refer to the making of a path 2 ft. 6 in. wide. The site of the path should be excavated to the depth of 9 in. or so, and filled in to within 3 in. of the surface of the path-to-be with brickbats, large stones, and ashes, well rammed down. This foundation may well be rather wider than the path itself.

Assuming that the path will be made in 3-ft. lengths, moulded in groups of four, and be 3 in. thick, two battens of 3-in. by 2-in. stuff, and 13 ft. long, and one 12 ft. 9 in. long, should be bought for making the moulds in which the slabs will be formed.

The shorter batten is planed on both sides and one edge; the two larger ones on what will be the top and the inside surfaces. Five bars, exactly 30 in. long, and with their ends accurately squared, are cut out of the shorter piece. These are the crossbars a a a a e in *a* of the diagram.

The mould is put together by nailing the battens to the crossbars with nails not driven home, so that they can easily be extracted. The clamping bars b b b d d are also tacked in to prevent the sides spreading when the concrete is tamped in position.

The spacing of the crossbars must be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

done carefully, to get slabs of equal length. In *a* of the illustration it is assumed that spaces A A will be filled in first, so the battens at the ends of the spaces are set 36 in. apart.

When the mould has been put together it should be laid on the site, levelled longitudinally, and adjusted to the correct line with the aid of a stretched string. A fall of 1 in. towards one side must be allowed to make the path self-draining. At this stage it is advisable to mark the 3-ft. distances on the sides with deep chisel-cuts, and to match-mark the crossbars and sides so that they may be reassembled later on in the same relative positions. The earth outside the mould is then rammed hard against it, or pegs are driven in in contact—but not reaching to the level of the top—to help prevent spreading. The squareness of the mould should then be tested, and fixed, if thought necessary, by diagonal pieces nailed across the B B spaces.

Construction.—The path will be made in two layers—a lower one, 2 in. thick, of concrete, and a 1-in. surfacing layer of sand-cement mortar. To assist in ensuring standard thickness, two gauge-boards are made, to run along the sides of the moulds. One of them *b* reaches 3 in. below the top; the other *c* 1 in. below.

The deeper gauge is used for levelling the bottom of a mould before filling. It is worked to and fro until it just clears protuberances which have been rammed down or a levelling coat of coarse sand, well tamped. The shallow gauge is employed to level off the concrete.

Mixing the Concrete.—A suitable mixture is: 4 parts of small ballast, passed through a 1½-in. riddle; 2 parts sharp sand, and 1 part quick-setting cement. The last is to be preferred to the slow-setting kind, as it releases the mould much sooner, while it is little, if at all, more expensive in use.

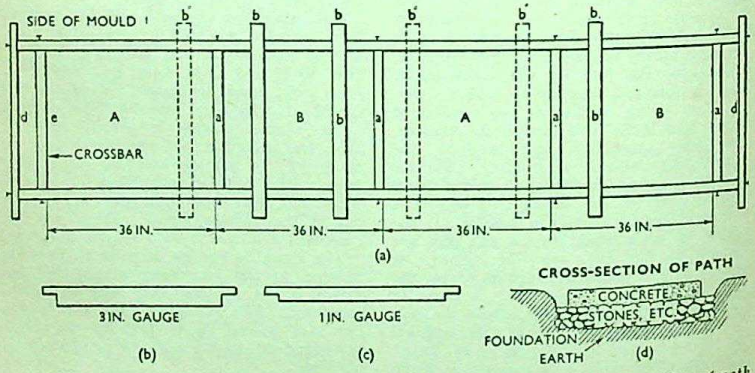
About 3 cu. ft. of ballast, 1½ cu. ft. of sand, and ¾ cu. ft. of cement will be needed to fill two moulds. It may be excessive or too little, and adjustments be needed in future mixings.

A good surface to mix on is essential, such as a wooden platform or a concrete or asphalt pavement. Whatever it be, it must be cleaned carefully after each mixing, and be given an extra thorough cleaning at the end of the day.

Equally important is a proper mixing of the materials, as on this the strength of the concrete depends. Spread out the ballast, distribute the sand evenly over it, and spread the cement evenly over the sand. Then turn the lot over and over with the shovel till it is of the same colour throughout. Flatten it out, and add as much water through a rose as, when thoroughly mixed in, will produce a slightly sloppy mixture. The quantity used should have been measured and noted for subsequent mixings.

The concrete is bucketed into the A A moulds. Begin filling along sides and ends, using the rammer liberally to work the material into the angles. A neater appearance along the edges will be ensured if the sides of the moulds are plastered with sand-and-cement mortar. Then fill up until the shallow gauge touches at all points.

Now get busy with mixing the surfacing mortar, which must be added *before the concrete has hardened*. Rather more than 1½ cu. ft. of sand and ¾ cu. ft. of cement will be needed for this. The mortar is brought up almost flush all over, and then levelled off with a wooden straight-edge,



(a), (b) and (c) show framework and gauges for concrete path. (d) Cross-section of path

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mortar being added just in advance of the straight-edge to bring it up level. This striking-off process requires care if hollows and holes are to be avoided.

It may be necessary to keep patting the mortar with straight-edge and trowel to work it down and prevent the straight-edge rising above the sides of the moulds. A broad round-ended trowel is useful for giving the final touches.

As soon as the A A slabs have hardened, crossbars *a*, *a*, *a* are removed, and *b*, *b*, *b* are shifted into the positions *b'* *b'* *b'* over A A as indicated by broken lines.

Pieces of linoleum or roofing felt, 3 in. wide and 30 in. long, are stood in contact with the ends of the A A slabs, to separate them from the B B slabs. The B B spaces are then filled, in the same manner as the A A spaces.

As soon as the B B's have hardened, the mould can be moved on for the next group, and reassembled as before, except that crossbar *c* will be omitted, its place being taken by the end slab, and the tie-bar *d* near it be fixed across the top of the mould instead of across the end.

While in soft condition the concrete must be protected in some way from animals and birds, rain and hot sun, and after it has set it should be kept damp for a fortnight or so by frequent waterings, as moisture plays a most important part in the hardening of the surface.

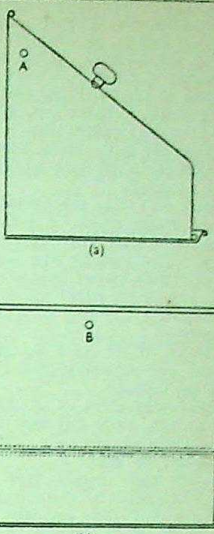
Expansion joints are provided every 12 ft. or 15 ft. by inserting in one end of a mould division a board 3 in. wide, ½ in. thick at the top, and tapering towards the bottom. This is drawn out as soon as the concrete next it has set sufficiently, leaving a slightly V-shaped slot which can be filled with pitch or sand.

Every time the moulds are moved, clean them up and grease all surfaces which the concrete will touch. There will then be no danger of sticking. Mixing boards and tools must be cleaned immediately after use, or they may give trouble.

COOKING, REFLECTOR FOR.—This is a modification of the Dutch oven, which at one time was commonly used in front of kitchen ranges. It will be found very useful for heating up food, frying bacon, and roasting cutlets, steaks, or even small joints, in front of an open coal fire or gas fire, if stood on a support of suitable height close to it.

The use of it does not necessarily involve the consumption of any extra fuel, as it merely traps heat which would otherwise be radiated direct into the room, and, after doing its work in the reflector, adds to the general warmth.

It consists of a hood, and a tray into which the hood fits loosely. The hood has



Reflector for cooking. (a) Side sectional view. (b) View from the front or fire side. A is the hole in end for a suspension bar. B is the hole for hanging up the reflector

an open front and a top which slopes downwards at an angle of about 45 degrees to join a vertical part at the back about 3 in. high.

The hood consists of three parts—two ends and the back. The material used throughout is stout tinned steel sheet, of high-quality finish. A sectional side view through hood and tray is given in *a* of the illustrations, and a front view in *b*.

These show that the edges of the tray and hood are strengthened by being turned round stout iron wire ¼ in. thick. Allowances for the turnovers round wires must be made at the front and bottom of the ends, the top and bottom of the back and the flanges of the tray; and as the back has to be riveted to the ends, ½ in. must be allowed for right-angle laps on the back where it touches the top and back of the ends.

The reflector may be rectangular in plan or, as shown in *b*, taper slightly towards the back. The second form is neater, but somewhat more difficult to construct. As regards size, the following dimensions can be recommended:

Height at front 9 in., height at back 3 in., depth from front to back 8 in., width 13 in. A reflector built to this specifica

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

tion will hold an ordinary pie-dish or dinner plate easily. A knob or handle is needed at the back for lifting the hood. If a dropping loop handle is used, it should be attached at the balancing point.

At the centre, near the top, should be a hole, so that the reflector may be hung up face towards the wall. Holes may be made in the ends for a rod from which to hang meat for roasting.

The back and ends are riveted together with small copper rivets. A U-shaped loop of wire is then made to fit top and sides of the front. The laps for the wire, which should have been turned over partly before riveting, are beaten round the wire with a light hammer. The tray is wired in the same manner.

The inside of the hood should be kept clean, as its reflecting power will be reduced by dullness.

CORKS.—Odd corks of all sizes should not be thrown away but kept in a box. Some of them at any rate will come in useful sooner or later.

Holes are made in corks most easily by burning them with a red-hot wire.

Corks are not quite air-tight, but they can be made so by soaking them in hot paraffin wax.

A very sharp knife is needed for cutting cork.

Corks become compressed by frequent use, especially if wetted. An eye should be kept on the corks of vacuum flasks lest they become too loose a fit.

New corks should be softened before use by soaking them in water.

A large flat cork, secured to the floor by a screw and washer, makes a good door-stop.

Corks are useful for cleaning metals, either dry or dipped in finely powdered pumice.

To secure a cork so that it cannot work loose or be drawn out, make a round loop in a piece of string and draw one part of the string up through it in a U-loop. The round loop is passed round the neck of the bottle with the U-loop over the cork. The string is then pulled tight and the ends tied together on the cork, which is thus held down by four turns.

CORRUGATED IRON.—This is the cheapest material for covering the roofs and sides of outbuildings. The corrugations give it great stiffness and, if well galvanized, as it should be, it will resist rust for many years.

The standard width of sheets is 26 in. This gives an effective covering width of 2 ft. and allows one corrugation for overlapping a neighbouring sheet along one edge. Lengths run from 4 ft. to 10 ft. Thickness is indicated by a Birmingham Wire Gauge number. The smaller the number, the thicker the material.

The gauges most used are 22, 24 and 26. A hundredweight of No. 22 sheets will cover 64 sq. ft., allowing 6 in. overlap at the ends of sheets; of No. 24, 77 sq. ft.; of No. 26, 105 sq. ft.

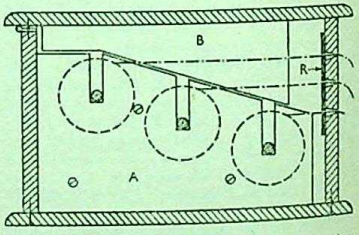
Except where a roof is very exposed, a slope of as little as half an inch to the foot will suffice. New corrugated iron can be blackened by washing it with a solution of: water, 3 pints; hydrochloric acid, nitrate of copper, chloride of copper, and sal-ammoniac, one ounce each. It will then take paint readily, though if left untreated it affords a poor hold. (Old galvanized iron, however, does not need treatment.) Paint increases the life of a roof by delaying the separation of the protective zinc coating from the iron.

Since it transmits heat very freely, corrugated iron over enclosed places should be lined with boarding, felt preferably being interposed. This will prevent condensation in the inside which, in certain states of the weather, causes a heavy drip.

Corrugated iron should be attached with galvanized screws, passed through the "hills," and each having a washer under the head.

Both because this material is awkward to cut, and to avoid waste, a building which is to be covered with it should be dimensioned to suit standard lengths. For example, sides 6½ ft. high would need 7-ft. lengths cut down; whereas if they are 6 ft. or 7 ft. high no cutting would be needed. Similarly, the length of a side or roof should be a multiple of the covering width of a sheet.

COTTON-REEL MAGAZINE. — The illustration shows a box for holding a large number of spools of different "numbers" and colours of sewing-cotton or silk. The



Section through a cotton-reel magazine showing inside of one end. A is the rack in which the ends rest to carry the reels. B, securing piece attached to lid. R, rubber. Dotted circles indicate position of reels, and straight dotted lines the threads held by rubber with ends hanging down

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

reels are threaded on bars, the ends of which rest in slots cut in pieces A, screwed to the inside of the ends of the box. When the lid is closed, pieces B, attached to the lid, prevent the bars coming out of the slots.

The numbers of reels that can be accommodated depends on the internal length of the box, but it is roughly three to every 1½ in. A box 9 in. long would therefore hold 18 reels.

Rows of conical holes are bored in the front of the box, one row for each tier of reels; and to the inside is stuck a piece of rubber R, through which each thread is passed with a needle, the object of the rubber being to prevent a thread-end slipping back into the box after a length has been cut off. Dots of paint on the rubber opposite the holes assist in threading a new reel.

CREEPERS ON THE HOUSE.—It cannot be charged against the self-clinging creepers, Virginia creeper and ivy, that they make walls damp, for the screen of downward-pointing leaves which they present does a great deal in preventing rain reaching the brickwork or masonry to which they cling.

There is no doubt, however, as to their capacity for doing damage if not kept in check. Ivy particularly has great destructive powers, being only too ready to insinuate itself into any crack that offers—under a window ledge, or into the reveals round a window, behind pipes, or even into open joints in the brickwork.

The expanding power of plants is tremendous, and ivy gives an example of it if afforded the chance. Therefore, if ivy is permitted on a house a strict watch should be kept on its behaviour.

Both it and Virginia creeper are rapid climbers, the second especially, and may invade gutters, and even the roof, before this is noticed. A roof, it need hardly be said, offers great scope to ivy for doing damage by getting between tiles and slates and displacing them.

Either creeper gives rain a bridge over the gutters from roof to walls, and on this count alone wandering beyond the eaves should be severely discouraged. Other accusations laid against ivy are the destructive effects of its rootlets on the pointing of walls, and of its roots on foundations and drains. The second, it may be added, applies also, if not to an equal extent, to Virginia creeper and all climbing plants grown against walls.

But when all is said and done, many people are content to risk a little structural damage in consideration of the structure itself being hidden more or less completely by beautiful vegetation.

Climbing Plants.—Roses, clematis, jasmine, wistaria, berberis, cotoneaster and other climbing shrubs and fruit trees grown on house walls should be provided with trellis or wires to which they may be tied.

Driving nails into bricks or joints is very damaging to a wall, as many an old wall on which gardeners have worked their will for several decades will testify. Nails are at best insecure points of attachment. On the other hand, trellis well fixed will stand a heavy strain, and tying to it is far easier and quicker than nailing.

Where trellis is objected to, wires run through galvanized eyes at horizontal intervals of a foot or so, and tightened with screw strainers, may be adopted as a less conspicuous, and fairly satisfactory, substitute.

CYCLES AND THEIR MAINTENANCE.—A cycle is of the right size for a rider if, when a heel is placed on a pedal in its lowest position, with the leg fully extended, an inch or so of saddle pillar projects from the saddle tube.

A three-speed gear, though it adds considerably to the cost of a cycle, is well worth the extra money. It makes riding more pleasant and less laborious in undulating and hilly country, and in windy weather.

Either brake should be capable of pulling up the machine quickly, when used alone. Transmission from brake levers to brakes should be by rods, not cables, which are subject to rusting and therefore unreliable.

The front mudguard should project some inches beyond the front fork. Chain-cases must be well fitted to avoid rattle. It is important that the saddle should be a thoroughly comfortable one, especially if the machine is ridden long distances. The saddle wallet should be large enough to accommodate a repair outfit and cleaning rag as well as the tool kit—the items of which should be preserved carefully—and oil-can.

The self-contained electric lamp, weighing about 1½ lb., is the most handy form for town use or for touring in the long days. One with a carrying handle is to be preferred. Acetylene lamps should be kept charged with carbide, and water should not be poured into the reservoir till the lamp is likely to be needed. A pricker for the burner should be carried.

Care of Cycles.—Mud is most easily cleaned off while wet. Polishing with a rag moistened in french polish or paraffin oil may be done later.

Painting over bare places on the frame from which the enamel has chipped away retards peeling round them. If handlebars, cranks, rods, etc., lose their plating, rub them as smooth as possible with emery

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cloth, and paint them with one of the cellulose enamels sold for the purpose. The same covering is recommended if a bicycle needs smartening up generally.

To make a neat job, the old enamel, if in bad condition, should be scraped off all over before the new enamel is applied. When cellulose enamel is laid over old enamel, varnish, or paint, it should be preceded by the special under-coating supplied by the makers of the enamel.

Lubrication.—The hub, crank, pedal and front fork bearings should be oiled occasionally through the caps or holes provided. Proper lubrication lengthens the life of these parts. The chain, which has many exposed frictional parts, needs special attention, as both it and the teeth over which it runs will wear much more quickly if left dry and gritty.

To clean and oil a chain very thoroughly first brush it all over with an old tooth-brush, to get rid of all loose dirt. Then move it until the screw rivet is on the large sprocket. Take chain off, put rivet and lock-nut back in place, and lay the coiled chain in a pan of paraffin oil.

After it has soaked well, rub it with an old rag, and dry it in the oven. It should now be fairly free from grit. To get oil in between rollers and the link rivets on which they turn, immerse the chain in oil. Wipe off surplus oil and replace chain on cycle.

Ordinary lubrication of the chain can be done quickly as follows: Turn the chain backwards while a brush is held up against it, to clean it. Then hold a can so that the oil drops first on one end and then on the other of the rollers. Keep turning the pedals till the oil has worked well in; then wipe the chain. A little graphite grease smeared on the rollers will reduce friction between them and the chain wheels.

When using the oil-can be careful not to let oil fall on the rims or tyres, since oil is very destructive of rubber. Any oil which should fall on them must be wiped off at once.

Chain Adjustment.—When properly adjusted, a chain will just not be taut at any point of a revolution of the big chain-wheel. It cannot then be unduly strained, nor can it get out of place on the teeth. If the large chain wheel is unsymmetrical or badly centred, the slack in the chain will vary with different positions of the cranks, and the only thing to be done is to make sure that some slack is left in all positions.

To adjust the chain, first slacken the nuts on the ends of the rear hub spindle. The spindle may then be drawn backwards in the forks by turning in a clockwise direction—as viewed from the back of the machine—the nuts on the ends of draw-bolts encircling the spindle and projecting through bridge-pieces on the tips of the forks. Screw them up alternately a little at a time, taking care to keep the wheel central in the forks, until the chain is tightened sufficiently.

Should the tightening have been over-done, unscrew the nuts a little and tap the spindle nuts with a hammer, to shift the spindle forward a trifle. Tighten up spindle nuts, and tighten the adjusting nuts against the bridge-pieces.

Just one caution: adjusting a chain, by moving the wheel, alters the distance between the rim of the wheel and the brake blocks, and some readjustment of the brake may be needed.

Tyres.—Tyres will last longer if kept well inflated, so that they shall not flatten out too much, or bump, under the weight of the rider. Slack tyres mean harder work in pedalling. The back tyre has to carry more weight than the front one, and should be blown up harder—though not so hard that a bulge is not formed when the rider throws his weight on to the saddle.

A leaky valve is a great nuisance, and its rubber sleeve should be replaced if a moistened finger rubbed across the tip of the valve causes a bubble to form. Losing the little screw-on cap aggravates leakage, for if the cap is in place it may arrest air which has got past the sleeve; so inflation will be less frequently required if the caps are always replaced after renewal.

To get at the sleeve the removable part of the valve, called the plug, must be extracted after the milled metal sleeve which presses it into the body of the valve has been unscrewed. As the rubber sleeve will probably have stuck to both parts, between which it is pinched to make an air-tight joint, getting the plug out will most probably break the sleeve and leave bits of it adhering to the seating in the body.

These must be detached before the re-sleeved plug is replaced, and the job is most easily done with a large pin, the tip of which has been turned over to form a very small hook. (This should be carried in the repair outfit box.) The plug is then scraped clean, and examined to see that the air passage through it is clear. Should this be even partly blocked with dirt, inflation will be much harder work.

A new sleeve is then worked over the plug, until the top end has passed just beyond the "swell." Make sure that the rubber is not wrinkled at any point. Dip the sleeve in french chalk and replace the plug, making sure that the little lugs projecting from it are in line with the slots in the tip of the body. Screw the metal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sleeve down tightly, and, if the locking nut which draws the body up against the inside of the rim is loose, tighten that also. If this is left loose, the cover may creep and the inner tube be torn away from the valve.

When a cycle is stored away for a long period, it should either be hung clear of the ground, or turned upside-down on to handle-bar and saddle, to take all weight off the tyres.

Mending Punctures.—If a tyre deflates slowly, the valve may be at fault, and this should be tested; but if it flattens suddenly, a puncture is probably the cause. Examine the cover and if a projecting nail or thorn is found, do not extract this till the place has been marked with pencil or a piece of stamp paper, to assist in locating the puncture in the tube.

A rear tube must be taken out on the side away from the chain. As beaded-edge tyres have a wide internal flap on one edge and a narrow one (meant to come off first) on the other, the cover should have been arranged with the narrow flap on that side; and, to avoid confusion, both covers should be removable on the left side of the machine. Wired-on tyres — now more popular than the beaded edge—can be taken off either side with equal facility.

The cycle having been turned upside-down, the valve stem is stripped of collars, so that it may be drawn inwards through the rim, and the plug is removed. The cover is pushed inwards until free from the rim all round, and levered off, beginning at the valve and working in both directions. A wired-on cover, be it noted, will not give enough slack unless the cover be pushed into the centre line of the rim at the point farthest from the lifter; whereas a beaded edge comes off as soon as unhooked from the rim.

Extract the valve and pull the tube out. It must be passed very carefully between brake block and rim, or it may be torn. Inflate tube and listen for escaping air. If the leak cannot be found, immerse the tube in water, when air-bubbles will soon reveal the puncture.

Clean an area an inch across round the puncture with glass-paper or petrol till it is dark all over, and smear it thinly with rubber solution. Then solution one side of a patch in the repair outfit. When the solution on both is "tacky," press the patch firmly into place and hold it till it adheres firmly everywhere. It may then be left while fingers are run round the inside of the cover to search for possible thorns, and a little french chalk is rubbed into the canvas.

At the end of 15 minutes or so, french chalk the patch and inflate the tyre to make sure that it is air-tight. If it is, deflate and work it back into place, beginning with the valve; and then inflate it slightly, so that it may not get pinched between the cover and rim. Work the tyre on, beginning opposite the valve and finishing at it. The valve is pushed in, so that the foot shall get above the edges of the cover, and the tyre is inflated. Finish by screwing the locking collar on the valve hard against the rim.

Brakes.—These are the most important fittings of a bicycle. The rider's life will often depend on their efficiency. As soon as the brake blocks wear thin they should be replaced, for if a shoe touches the rim it may cut it, and in any case the block in it will get no grip.

The operation of replacing the blocks is not a difficult one, but it will be done cheaply enough by any cycle dealer. Look over the brake gear occasionally—if touring in hilly country it is advisable to do this daily—and make sure that all nuts and screws in it are tight.

Cleaning and Adjusting Pedal Bearings.—Spread a cloth under the pedal to catch anything that falls. Unscrew the cap on outside of pedal, and then the lock-nut on the pedal pin. Beyond this is a D-washer, unable to revolve on the spindle. This has to be removed to allow the cone of the outer bearing to be screwed off. The balls of the bearing must be collected when they fall out and be set aside; and the same remark applies to the balls of the inner bearing. Any rusty or broken balls should be replaced by new.

Having cleaned the cones and the cups in the pedal, smear the cups thickly with vaseline, and embed the balls in it. They will then stick in place while the pedal is slipped over the pin and the cone screwed up. Replace washer and lock-nut, and adjust until the pedal will turn freely without any endways play when the lock-nut is tight. Replace the cap.

DISTEMPERING CEILINGS AND WALLS.—Ordinary distemper is a mixture of whiting, glue and water. The glue binds the particles together and to the plaster. If colouring matter be added, what would otherwise remain simple whitewash becomes colour wash.

This simple form of distemper cannot be cleaned with water, and is easily stained. For the walls of living-rooms a more permanent distemper, which can be washed, is desirable. Many kinds of "patent" distemper or water paint are sold by colourmen. If one of these be selected, the printed instructions should be adhered to.

The following paragraphs relate to the preparation and application of what may be termed home-made distemper of the kind

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

first mentioned. The first few of them, however, cover the use of distempers generally.

Preparing the Surface.—As a necessary precaution against splashing, the room to be distempered should be cleared of all furniture, and the floor be covered with newspapers. Further, if the ceiling is to be done and not the walls, the latter should be protected by newspapers pinned to them. The beginner at any rate will be thankful for having taken these preliminary measures.

The old distemper must be worked off with a brush dipped repeatedly in water, and with a wet sponge, until the plaster below is exposed. Should the old coating be very rough and thick, scraping with a piece of glass may be needed. Note when first applying the water whether the plaster soaks it up quickly, or remains wet a long time, for on the porosity of the plaster will depend the after-treatment of the surface.

It is very important to clean the plaster thoroughly, since any dirt or patches of old stuff left on will very probably show through the new coat.

After washing-off, all cracks should be cut out, damped, and stopped with plaster of paris. When the surface has dried, the fillings should be rubbed down with fine glass paper.

Preparing the Distemper.—Unless the surface has shown itself to resist water, the distemper proper should be preceded by a coating of clearcole, which is a solution of size with, usually, some whiting mixed in.

The object of clearcoling is, like that of sizing a wall before papering it, to prevent the plaster being too absorbent. If the water in the distemper were to be sucked in too quickly, it would be difficult to keep a "wet edge," and there would be a danger of the surface looking smeary wherever the brush touched partly dried distemper.

Time will be saved in preparing the clearcole and distemper if one pound of gilder's whiting for every 40 sq. ft. of surface to be covered is broken up and covered with water to soak before the washing-off begins. If glue powder is to be used instead of jelly-like "tub" size, this also should be put to soak. When it is fully swelled, 1 pound of glue will make 1 gallon of size.

To make the clearcole, a pailful of size or jelly is mixed with a little water and heated till it almost boils, being well stirred the while. It is then poured over one-third of its bulk of the soaked whiting and stirred until the latter has been mixed in thoroughly. If the ceiling is much discoloured, half as much whiting as of size may be advisable, and the latter proportion is suitable for walls.

The rest of the whiting, after any free water has been poured off it, has a little ultramarine—well mixed with water and whiting to form a paste—added to it to kill any yellow tinge it may have and produce a fine white. Hot size is then added a little at a time, in the proportion of about 1 gallon to every 6 pounds of dry whiting used, and after a good stirring the mixture should be strained through canvas and put aside to cool. When cold it should be a very thin jelly. If too thick a little hot water should be added; if too watery, more whiting and size.

For colour wash, the necessary pigment should be mixed with the whiting *before* the size is added, and a test be made by allowing a little to dry naturally on white paper, when the tint will be found to be lighter than that of the wet mixture. More colour or whiting must be added to correct matters if the dry tint is too light on the one hand, or too dark on the other. Since matching of mixed colours is rather difficult, the quantity of distemper provided should err on the side of excess.

The clearcole may be applied hot and liquid, or after it has cooled to a jelly. Cold clearcoling is advisable if the surface is very absorbent.

Applying the Clearcole.—The brush used for both clearcole and distemper should be a proper distempering brush; which, it may be added, should always be well washed and dried after use.

The brushing, when once begun, should be carried through quickly, so that clearcole or distemper already applied may still be wet when the brush overlaps it, while doing the next strip. Therefore a working platform of good size and easily moved—a table, or planks resting on tables or step ladders—should be provided.

To delay drying while the brushing is in progress, all windows and doors should be kept closed. But as soon as the coat is on they should be opened, to create a current of air and promote quick and even drying. Nor should any attempt be made to lay off the distemper like paint by finishing strokes in one particular direction.

Distempering.—The distemper is applied in the same manner as the clearcole, by short strokes in all directions, care being taken not to miss any places, since retouching afterwards will not be successful. Should a ceiling show bare patches when dry, the only safe course is to go over it again, using a thinner distemper. The same course will have to be followed if the ceiling is not evenly white all over.

If distemper is too rich in size it tends to flake off; if too weak, to rub off easily.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Surfaces which are much cracked and show signs of looseness should be papered with lining paper, and the distemper applied to this.

It is useless to distemper walls where they have been discoloured by damp, until the darkened places have been gone over with a quick-drying flat paint of some kind.

Since a large surface of smooth distemper throws up any irregularities of tone or brushing, it is common practice to stipple wall distemper while wet with the points of a special stippling brush and give it a "grain." When this is to be done a second person should follow with the stippler closely behind the distempering brush.

DOG KENNEL, A SANITARY.—The kennel of which constructional details are illustrated here has a bottom separable from the body, to make thorough cleaning easy—a very necessary provision often overlooked.

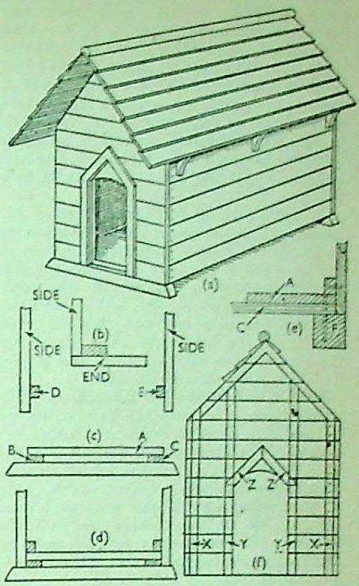
Matchboarding is used for sides, ends and bottom; weatherboarding for the roof. The dimensions should not be less than: length and height, 30 in.; width, 20 in.; even if the kennel will be used for a small dog in the first instance, it may well be needed later on for a larger animal.

The ends are made first by nailing matchboarding across four 2-in. by 1-in. battens—X X, Y Y—the upper ends of which are halved into two roof-pieces; X X are set inwards from the ends of the boards by a distance equal to the thickness of the sides, so that these may be behind and flush with the ends (*see* illustration *b* which shows the junction of an end and a side in plan). The door is cut out with a padsaw before Y Y are fixed, the vertical saw-cuts being a little farther from the centre line than Y Y, so that these shall protect the dog from rubbing against the rough wood. Short verticals outside, in line with Y Y, complete the protection.

The sides are now nailed on to the X X's of each end. (*Note.*—All the matchboards must be arranged with tongue upwards, to prevent water lodging.) Battens D and E (diagram *b*) are then nailed to the sides and back end, inside, at a distance from the bottom edges equal to the thickness of the bottom boards and the battens B and C to which these boards are fixed.

The weatherboards of the roof project 6 in. beyond the door end, to prevent rain blowing in; and 3 in. beyond the sides to throw water clear of the sides. The eaves are supported by wooden brackets nailed to the sides. Begin laying on at the eaves, and work up to the ridge, which is made watertight by a notched wooden beading or a 6-in. strip of zinc bent into V-shape.

The bottom is raised off the ground by



(a) General view of kennel. (b) Detail, in plan, of side and end. (c) Kennel raised off bottom board. (d) Kennel lowered on to bottom. (e) Vertical section through front. A, boards of bottom. C, one of the battens to which bottom boards are nailed. F, crossbar to keep kennel clear of ground. (f) Front of kennel. ZZ, outside pieces to give finish to door hole, also shown in (a)

two cross-pieces of 2-in. by 2-in. deal, on which the body rests at the ends. These pieces are set out beyond the bends of B C, to be flush with front and back.

The kennel is thoroughly creosoted outside, and limewashed inside. The inside should be exposed to the sun occasionally, and the bottom boards be well scrubbed at the same time.

DOOR BOLTS.—These are of many different kinds and patterns. The majority are for screwing to the surface; others are sunk into the door flush. All are simple devices and seldom give trouble, provided that they are kept properly lubricated.

A bolt which shoots into the solid wood of the door frame gives better security than one with a socket or staple, unless the latter is stout and secured with large screws. The resistance of a bolt is only that of its staple or socket.

Circular bolts with knobs which can be turned against the door are not so likely to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

catch on things as those with knobs that cannot be reversed. Bolts of the first kind should be used on house doors with glass in them, or on doors in outside partitions, since when the knob is turned down it cannot be moved by striking from above with a stick or other implement. If a bolt is difficult to get into its socket, owing to the door having warped or sagged slightly, remove it and file the end all round to a taper.

A useful form of bolt for outhouse doors, gates, etc., is the padlock bolt with a hasp in place of a knob. A rectangular hole in the hasp passes over a staple when the bolt is revolved, and a padlock in the staple makes movement of the bolt impossible.

When fitting a bolt and ring staple or socket, fix the bolt first; shoot it; adjust the staple on it and screw on the staple. The two must then be in line.

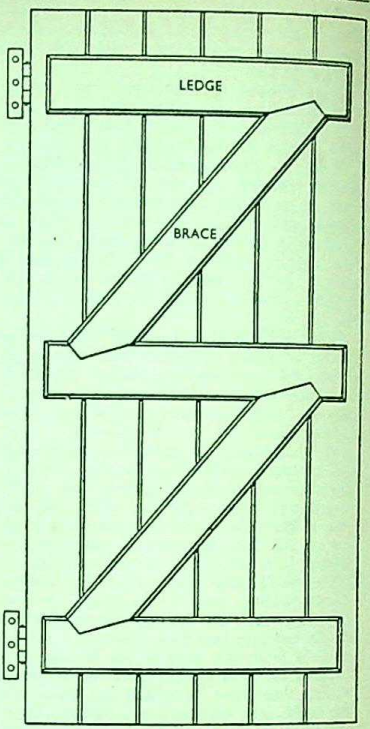
DOOR, LEDGE-AND-BRACE. — The construction of a panelled door is beyond the abilities of most amateur joiners; but a door of the kind to be described is easily put together. It is composed of vertical matchboarding held together at the back by horizontal ledges, and prevented from sagging by oblique braces let into the ledges. The boards may be ¾ in. or ⅞ in. thick; the ledges and braces should be of 1-in. stuff, 6 in. or 7 in. wide.

Assuming the door to be 3 ft. wide and 6 ft. 6 in. high, the boards should be 6 ft. 7 in. or 6 ft. 8 in. long. As many boards will be needed as will give a width of 3 ft. when the groove of one outside board and the tongue of the other have been removed. Assemble the boards and square across them the positions of the ledges. The ledges look smarter, and throw off water better, if their edges are bevelled all round as shown in the illustration. The braces are bevelled on the edges only.

Each ledge is screwed at one end to one outside board. The boards are then cramped tightly together, and the ledges screwed at the other end. The door can then be turned over for the intermediate boards to be nailed to the ledges. The ends of nails should be clenched flush along the grain of the wood.

Now comes the making and fitting of the braces. To be effective, the braces must run in the correct direction, that is, upwards and away from the hinge edge of the door, so that they shall be in compression. Each end of a brace is square-ended part-way across and then sloped off to the edge of the ledge.

To mark a brace, lay the board out of which it will be cut across two ledges, with its edges not less than 2 in. from their ends. Pencil marks are made on the



Easily made ledge-and-brace door. The illustration shows the back view, with the arrangement of the ledges and braces

brace over the edge of the ledges; and it then has the ends shaped, and is cut out. The ledges are marked off from the brace, and notches cut in them. Care must be taken that these are not too deep, as the braces must be a tight fit.

Any slack will allow the door to settle and get out of square. When the braces have been placed and nailed on through the front, the ends of the doors are squared across and sawn to their final length.

The hinges to be used are "cross garnets" which should be at least 15 in. long.

A door which is to be painted and will be exposed to the weather should have all surfaces painted *before* assembling that will be inaccessible to the paint-brush afterwards—tongues and grooves, insides of ledges and braces. White-lead paint is the best to use for the joints. If these are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

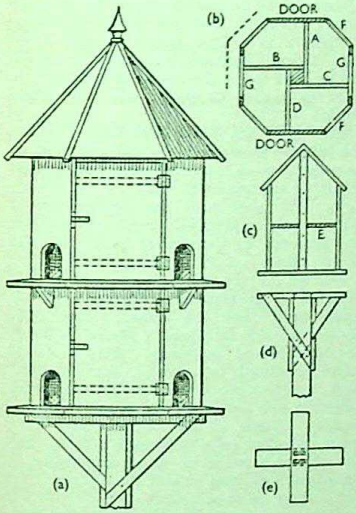
well sealed, water will not be able to find its way in.

Low doors of this kind need a ledge at top and bottom and one brace only.

DOVE-COTE, AN EASILY MADE.—There are still a considerable number of people who keep pigeons or doves, and many of them will be interested in the dove-cote which is described here. It is octagonal in shape, two-storied, and has four compartments in each storey, all of which can be got at for cleaning and inspection through doors in two of the sides.

The external appearance of the cote will be gathered from the diagram. The cote measures 18 in. to 20 in. across and is 3 ft. high, including the roof. Illustration *b* shows the construction in sectional plan. Four upright boards A B C D are nailed to the sides of a square centre-post and cut off at the top to the slope of the roof; and to them are nailed the pieces which form the floor of the upper storey.

The G G sides and four F F F F sides are fixed to the divisions and bottom board. The last projects 5 in. beyond the sides, for birds to alight on. Each of the four doors gives access to two compartments.



(a) External view. (b) Cross-section through interior, showing central post, division and doors (shaded). (c) Vertical cross-section. E, one of the floors of upper storey. (d) Cross at top of post, strutted to post to carry cote. (e) Cross, in plan, at top of post with mortise to fit tenon on top of post

The upper alighting platform is in eight pieces, nailed together at the angles and supported on brackets. The upper faces of both platforms are bevelled to throw rain outwards.

All eight entrances are marked out from a pattern and cut with a padsaw before the narrow F F boards are fixed. The upper doors must not be high enough to foul the edges of the roof when opened.

The making of the *roof* is a rather nice bit of joinery. The edges of all pieces are bevelled to fit neatly, on the outside at least, and the grain of the wood runs from eaves to apex. At the top the pieces are nailed to the top of the centre-post—suitably pointed—and at the bottom to the sides or battens across the inside of the doorways. The joints are made watertight with beadings or zinc strips, and the joint of the roof finished off with a spike or small weather-vane.

The post on which the cote is mounted will be of stuff 4 in. to 5 in. square, according to its length. Its upper end is mortised into the crossing-point of two horizontal pieces halved into one another and secured to the post by four struts (see *d* and *e*). The bottom of the cote is well screwed to the cross.

The bottom of the post is buried 2 ft. or more in the ground, after it has been charred or well tarred. The post is kept stable by four sloping ties nailed at the bottom end to cross boards, also well buried.

The cote and post should be given two or three good coats of paint outside, or be creosoted.

DRAINS, CLEARING.—On the principle that prevention is better than cure, the gratings to all gulleys should be kept in place, and be renewed if they break. Even if the gratings are in good order, dirt may work through them and form deposits which ultimately fill the trap and prevent water flowing.

The only course in such cases is to remove the grating, clean out the trap by hand, and flush the trap liberally till the water flows away as fast as it is poured in. In the autumn all gulleys should be inspected and cleared of leaves, a few of which are sufficient to choke them (see GULLEYS. COVERING).

A sudden flush with sufficient water to bank up behind an obstruction may prove successful where repeated flushings with bucketsful fail. Thus, if the obstruction is somewhere between the inspection chamber and the sewer, it is worth trying the effect of blocking the outlet of the pipe connecting house and chamber, and quickly pouring in the contents of a few baths, filled ready.

As the chamber fills, the pressure will

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

increase, until it may begin to shift the obstruction and finally work it clear. If the water sinks slowly, more should be added to maintain the pressure.

Should these measures not be effective, it may be necessary to remove the plug over the trap leading out of the chamber, and expose the branch pipe. This will give a straight run into the drain for the introduction of cleaning-rods, or a long cane.

If rods are not available, but a cane shows the obstruction to be fairly close to the chamber, the effect of the jet nozzle of the garden hose may be tried. The hose is lashed to the cane and pushed in, and the water is turned on. The erosive action of the jet may succeed where a small, steady pressure proves useless.

If the drain is blocked between house and inspection chamber, the inlet into the last should be blocked with a quickly removable plug of some kind and water be poured into the gulley from the sink till it shows. A sudden removal of the plug, simultaneously with a bucket being emptied into the gulley, may do the trick.

DRILLING METAL.—Boring holes in metal requires the use of special tools, the possession of which may on occasion save a great deal of time.

By far the most efficient type of drill is the fluted twist drill, made in diameters ranging from $\frac{1}{16}$ in. up to 3 or more inches. Small drills for making holes up to $\frac{3}{16}$ in. should have parallel shanks of the same diameter as the holes. A geared drill stock to hold them, with self-centring 3-jaw chuck, can be bought for a reasonable sum.

A heavier form of stock with a breast pad in place of a handle, so that the driller may press against it with his body, is efficient for drills up to $\frac{3}{8}$ in. diameter. A cheaper alternative is, however, to use drills with square shanks, fitting an ordinary hand brace of the kind used for boring wood.

Though it may be difficult to bore a hole direct with a brace and, say, a $\frac{5}{16}$-in. drill, the latter will penetrate easily enough if the way is prepared for it by a $\frac{1}{4}$-in. pilot hole made with the hand drill. But a drill should not be used to enlarge a hole only slightly smaller than itself, since it may gain and break.

Before drilling, make a centre-mark with a centre-punch, deep enough to give the drill a hold. In the absence of such a mark the drill will roam about and finally may begin boring in the wrong place. A circle larger than the drill scribed round the centre-mark will show the operator whether the drill is straying or not. If it strays before the bevelled part has entered, a nick should be made on the side to which it should go.

If a hole has to be bored right through, support the metal on a piece of hard wood or softer metal and go gently when the tip begins to come out. Otherwise the drill may dig in and jam. Should this happen, remove the drill and finish from the other side with a broach.

A broach, it should be explained, is a very gently tapering five-sided bar of very hard steel with a tang to set in a handle. A set of broaches of graduated sizes just overlapping each other is a very useful addition to a drilling equipment, especially valuable when holes in thin metal require enlargement.

A drill should never be run backwards, as doing so wears away the cutting edges from the back, and the drill will not then be able to cut freely.

It is a waste of time drilling with blunt drills. Small drills can be replaced for a few pence, and larger ones are worth the small expense of getting them reground—an operation which needs a special machine.

Except when drilling cast iron, a drill should be kept well lubricated.

The part to be drilled should be secured firmly, so that it may not revolve nor tilt.

When a drill has entered deeper than twice its own diameter, care must be taken not to bend it, as the metal of which it is made is highly tempered and somewhat brittle.

DRY ROT IN THE HOUSE.—Dry rot is a fungoid growth which, under conditions favourable to it, spreads over the surface of timber and causes the interior to crumble away. It may have the appearance of cotton-wool, or be black or a rusty yellow. Its presence is usually betrayed by the musty odour which it emits.

Dry rot may be due to the timber having been in an unseasoned or damp condition when built into the house. But good timber is liable to attack if placed in damp or unventilated positions. The ends of joints mortised into walls, for example, may develop it; or floors covered with linoleum and not ventilated properly underneath. Spores of the fungus may have been imported on a workman's tools, and for this reason it is most important to disinfect any tool which has been used for cutting affected timber.

Dry rot must be dealt with as soon as detected, for it spreads quickly and may, if left alone, do great damage. There is no cure, and the only safe course is to cut out all decayed wood and replace it with new material, after spraying or painting all the surfaces with a solution of sulphate of copper, or with carbolic acid or creosote.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Corrosive sublimate may also be used; but, as it is a deadly poison, it must be handled with great care.

All surfaces with which the wood has made contact should receive attention before the new woodwork is put in position, and if ventilation seems defective it must be improved, for fresh air is an enemy to dry rot. Many cellars have no proper through ventilation, and if they are damp, dry rot may appear in corners or dead-ends.

In such a case more openings should be made near these places to create air-currents.

Linoleum should not be replaced on a floor that has been treated for dry rot, nor be used anywhere else. The only safe course is to destroy it.

EARTHENWARE, MENDING CRACKED.—Where a strong mend is of more importance than appearance, procure strips of linen or fine canvas and smear them on one side with a mixture of gold size and plaster of paris worked into a fairly stiff paste. The strips are applied to the outside of the article along the cracks. When they are in place, some more adhesive may be rubbed in on the back and along the edges.

The adhesive takes some time to get hard, but then gives a thoroughly reliable joint, able to withstand heat. A fixed bathroom basin, so badly cracked and leaky as to be condemned, was mended in the manner described, and has been in continuous use for some years since this repair was carried out, without showing any signs of leakage.

ELECTRIC BELLS.—In some households electric bells and their circuits are regarded as troublesome fitments. But the blame more often than not rests with the householder; and, when all is said, the bell operated by a pull and a complicated system of wires and cranks is liable to cause more vexation. Witness the two facts that in old houses where the mechanical system still prevails there are sure to be a number of bells or pulls out of action altogether; and that few, if any, mechanical bells are now fittted in new houses.

Principles.—In order to be in a position to search for faults or carry out even the simplest installation one should have a general idea of how an electric bell acts, and how it is connected with push and battery.

Fig. 1 affords an explanation in a diagrammatic manner. The bell itself is mounted on an iron base, secured to a board. At the top are two terminals (T and T in the diagram). One of these is connected with the battery, the other with the

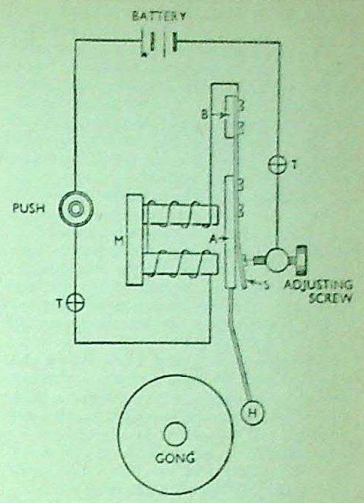


Fig. 1.—Diagram showing an electric bell circuit and working principles of the bell

push; and battery and push are also connected together.

A wire runs from the terminal T to an insulated pillar, in which is an adjusting screw. The tip of this screw makes contact normally with a stud riveted into a flat spring, S, which is attached at its other end to a part, B, of the iron base. The spring also carries a block of iron, A, known as the armature, one face of which is close to the poles of a horseshoe electro-magnet, M. From one end of the armature projects the hammer, H, for striking the bell.

When the button of the push is pressed in, two metallic parts, one connected with T and the other with the battery, are brought together. Current then flows through the circuit, which includes pillar, contact screw, S, and the windings of M. The magnet then becomes active, drawing A towards it, and causing H to strike the gong. The movement of A, however, separates S from the tip of the screw, and the circuit is broken, causing the magnet to become dead and A to move away under the influence of the spring.

As soon as S makes contact with the pillar screw again the circuit is restored, and the armature flies forward again, causing a second blow on the bell, and this cycle is repeated many times a second, as long as the bell push is closed.

Faults in the Circuit.—It will be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

evident from Fig. 1 that, beginning at terminal T and working round to terminal T, there are six points at which the circuit wires are connected with various fittings. In the bell assembly are four more connecting points, T, B, T and the pillar. Looseness or corrosion at any connection point, or the breakdown of the conducting wire between any two points, must obviously put the bell out of action.

Another place at which trouble may arise is the contact between the adjusting screw and S. If the screw is not screwed in far enough, S may not make proper contact with it when the armature falls back. On the other hand, if it is in too far, the spring may not clear it when pulled forward by the magnet, and the armature may be held fast by the latter.

If trouble is suspected here, loosen the set-screw and advance or retract the adjusting screw, while someone keeps a push pressed in, until satisfactory results are obtained. If the bell has been in use a long time it is advisable to brighten up the button on S and the tip of the screw with a few strokes of a jeweller's file.

In the large majority of cases—probably 95 per cent at least—bell trouble is due to the battery having become exhausted, or the connections with its terminals corroded. The latter defect is obvious to the eye, and can be corrected by scraping the contact parts bright and smearing them with vaseline.

A voltmeter will quickly show the condition of each cell. If one be not available, each cell in turn should be connected with the bell terminals. If it rings the bell feebly, or not at all, it must be recharged or scrapped, according to the type.

If a bell operated through several circuits refuses to ring when one particular push is pressed, but responds strongly to the other pushes, it may be taken for granted that the circuit of which that push forms part has a fault in it—perhaps a broken wire, or a loose joint, or a dirty connection. The only course then is to examine the wires of the circuit carefully if they are accessible.

A search may reveal a joint which has been made by merely twisting the wires together, allowing looseness or corrosion to develop. Every twisted joint found should, after the wires have been well cleaned, be soldered, to ensure metallic contact, a non-corrosive flux being used.

Batteries for Electric Bells. — The Leclanché cell, in either its "wet" or "dry" form, is used universally in ordinary household electric bell installations. A wet cell consists of (*a*) a glass jar or container, in which are placed (*b*) a porous pot, into which are sealed a projecting carbon slab, capped with a cast-lead top and a screw terminal, and a mixture of carbon grains and manganese peroxide; (*c*) a thick zinc rod with a looped wire projecting from the top; and (*d*) a solution of sal-ammoniac, two ounces to the pint.

The first three form the unit as it is bought from the electrician or ironmonger. To make it active, sal-ammoniac is dissolved in hot water, in the proportions given, and when cool poured into the cell until it reaches the black band on the porous pot. After the cell has been standing a day, the level will have fallen considerably owing to absorption by the contents of the porous pot, and more solution must be added to restore it.

When the cell is fully active, it will give a pressure of 1½ volts, but—and this is an important point to note—the volume of current will decrease if the level of the solution falls through evaporation. It is therefore important to examine "wet" cells occasionally and to make good any loss with fresh solution.

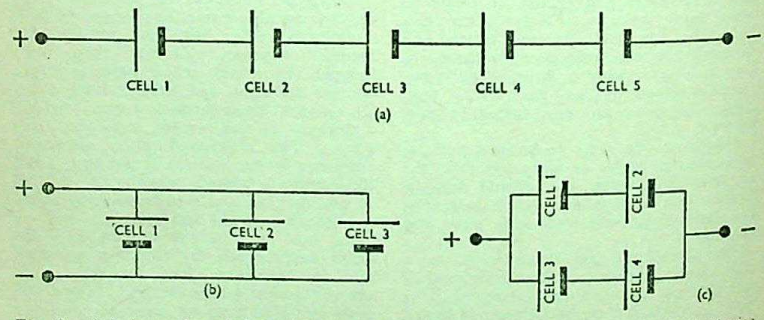


Fig. 2.—(a) A number of batteries connected in series. (b) Diagram shows batteries connected in parallel, and (c) illustrates diagrammatically batteries in series-parallel

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The zinc rod will gradually be eaten away and will need replacing at long intervals. Otherwise the cell will do good service if occasionally cleaned out and provided with fresh solution, though after very long use the porous pot will have to be replaced.

The other type, the "dry," is a modified form of the Leclanché, sold ready for immediate use. It is not actually dry, as it contains liquid chemicals absorbed by solid material. But it exudes no moisture, being sealed up, and can be laid on its side or carried about without fear of spillage. Moreover, it is free from one defect of the "wet" type, that of corrosion at the terminals; and in many cases is preferable to the wet cell, though over a period of years its use may prove rather more expensive.

It should perhaps be noted that the wire projecting from a point in the top of a dry cell is the counterpart of that attached to the zinc rod of a wet cell; and that a dry cell cannot be recharged but must be thrown away when exhausted.

Connecting-up Batteries. — The cells used, whether wet or dry, to make up a battery should in all cases be of the same size. The larger the cells are individually, the more work they are able to do before becoming exhausted.

Where circuits are long, several cells may have to be connected up "in series," as in Fig. 2*a*, the zinc negative of one cell to the carbon positive of the next, and the end terminals—one zinc and one carbon—to the circuit. The battery then gives a voltage equal to that of a single cell multiplied by the number of cells, and has a correspondingly greater capacity for overcoming resistance.

In most cases two or three cells in series suffice for the installation in a dwelling-house. Where there is only a single short circuit, a single cell only will be needed. Should this circuit be much used, the *effect* of a large cell is obtained by connecting small cells "in parallel" (Fig. 2*b*), all zincs and all carbons being regrouped to two terminals.

The "series-parallel" arrangement, shown in Fig. 2*c*, is a combination of the other two, giving greater pressure than simple parallel and greater capacity than plain series—the capacity of individual cells being assumed to be the same in all cases. Where cells are in series, the failure of any one reduces the pressure greatly, as the cell contributes no energy, while offering high resistance. It must therefore be either replaced or at least removed.

An advantage of the parallel and series-parallel arrangements is that the current is not blocked to the same extent by a faulty cell, since there is more than one path for it through the battery.

When a battery is running down, the longest circuit connected with it will probably become dead first, as having the highest resistance. Which circuit this is in a house can be found by inserting a pad between hammer and gong of the bell, unscrewing the cap of each push in turn, and testing with a voltmeter, the terminals of which are applied to the two brass springs of the push.

The longest circuit—or at least that with highest resistance—will give the lowest reading, and should be noted for testing condition of batteries. It may be added that the battery should be able to ring the bell strongly when this circuit is in use.

Installing Bell Circuits.—Twin wire, that is two wires separately insulated and enclosed in a single wrapping, is in most cases more conveniently and neatly run than two single wires. Whichever is selected, it should harmonize in colour as closely as possible with the surface to which it will be attached.

Before purchasing wire, run a string over the course selected for the circuit, following it as exactly as possible. This will give you the length of twin wire needed, or half the length of single wire. Allow a yard or so for connections and waste.

For fixing the wires use electrician's copper staples with padded tops where they will not be unsightly. If ordinary iron staples are employed, take care not to drive them in hard, or they may cut the insulation or break the wire.

Run wires in angles and other inconspicuous places, such as grooves on skirtings or mouldings. Where there is a cellar, it may be convenient to lead the wires down into it and along the ceiling. Whatever be the course selected, the wire should not be exposed to damage and should be easily accessible for examination.

Suppose that an electric bell is required for the front door. A suitable place for the push will be on what is the right-hand door-post to a person outside the house. The bell will probably be heard best from all parts of the house if placed in the entrance hall. A bell and battery mounted on a single bracket can be purchased, and would simplify fixing.

A hole ¼ in. in diameter is bored through the door-post at the point where the centre of the push will be. The twin wire is pushed through, and the wrapping removed for an inch or so, to allow half an inch of each of the two conductors to be freed of insulation. The ends are brought through the back of the push, bent into eyes and secured under the screws provided on the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spring pieces. It may here be stated that a connection loop should be so bent and applied that tightening up the holding screw or nut tends to coil it closer and not open it.

When the wires have been connected, the push is screwed on to the post. On the farther side of the post form a loop of an inch or two of wire, to allow the push to be drawn forward, clear of the post if need be, and anchor the wire beyond the loop with a staple. The wiring is then continued till the bell is reached, when it is cut off at a point which will allow one of the conductors to reach a battery terminal, and the other a terminal on the bell. A piece of single wire is used to connect the remaining bell terminal with the other terminal of the battery.

If the battery is located some distance away from the bell, for convenience or other reason, the twin will be led from the push to the bell, one conductor cut, and the two cut ends be connected to the bell terminals. The twin is then carried on to the battery. Should the battery, on the other hand, be nearer the push than the bell is, the wire is taken to it first, one conductor is connected up as described, and the twin is extended to the bell.

In cases where there are several circuits to a bell, twin wire may run from every push to a board on which there are two rows—A and B—of terminals, all those of a row being metallically connected. The ends of each twin are clamped to an A and a B terminal; and the rows are connected with one terminal of the battery and the bell respectively. A wire joining the other terminals of the battery and bell completes the wiring.

The arrangement is practically the same where an indicator of the mechanical replacement pattern is used. The diagram supplied with the indicator will, however, show the necessary details.

ELECTRIC LAMP, BED-HEAD CLAMP FOR.—Plane up a piece of wood 12 in. long, 3 in. wide and ¾ in. thick. Round off the four corners, and divide it into two parts by sawing it squarely through along a line 5 in. from one end. The longer piece forms the front, which will be turned towards the bed; the shorter, the back.

Clamp the two pieces together with their square ends in the same plane, and fit them with a pair of small brass butt hinges, screwed on flat. Bore a ⅜-in. diameter hole through both parts on the centre line, 2½ in. from the hinge end in the front, and 2¾ in. away in the back part. Separate the parts by unscrewing one side of each hinge.

Procure a $\frac{5}{16}$-in. cup-headed bolt with square neck under the head, 2½ in. long, and a washer and butterfly nut to fit it. File away the head on two sides down to the neck. Sink a rectangular slot in the back across the bored hole, deep enough for the head to enter flush; and slope the holes outwards towards the inside sufficiently to allow the bolt to swing upwards and downwards as the clamp is opened or shut.

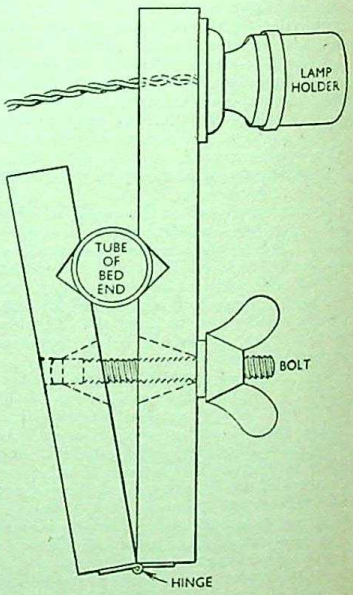
Across the inner face of each piece make a pencil mark 3¾ in. from the hinge, and draw parallel marks ⅜ in. away on either side of this. Along the centre mark sink a saw-cut ⅜ in. deep, and make sloping cuts to the bottom of this from the other two marks to form a triangular notch.

The holder for the lamp is screwed to the face of the front, near the top, after a hole for the twin flex has been bored. Assemble the parts, and test the clamp on the frame of the bed-head, which is assumed to be of metal tubing.

If desired, the notches may be enlarged with a gouge to fit the tube, and be lined with leather or cloth to prevent scratching.

Loosening the screw allows the clamp to be adjusted to throw the light down at any required angle.

ELECTRIC LIGHT IN THE HOME.—Lighting current is brought into a house by two conductors connected with the



Handy bed clamp for an electric light

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

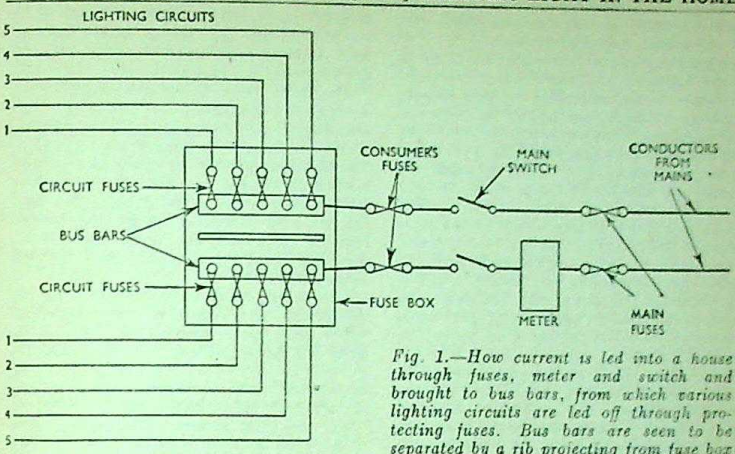


Fig. 1.—How current is led into a house through fuses, meter and switch and brought to bus bars, from which various lighting circuits are led off through protecting fuses. Bus bars are seen to be separated by a rib projecting from fuse box

street mains (Fig. 1). Immediately after entering, the conductors are connected to a pair of fuses controlled by the suppliers. Beyond this they run (one has to pass through the meter on the way) to a "double-pole" *main switch*, the opening of which cuts both conductors off from what is on the farther side of the switch. The identity and purpose of this switch should be known to every responsible person in the house.

From the main switch the conductors go through another pair of fuses, to the *distribution* or *fuse box*, from which branch off the various lighting circuits of the house. To every circuit-conductor connected with the box there is a fuse. The two fuses of a circuit are arranged one on each side of a projecting rib, which makes it difficult or impossible for an object to touch both fuses at the same time. The glazed cover of the box should be kept locked if within the reach of children.

A lighting circuit throws out branches to the various lamps, or groups of lamps or wall-plug sockets, which it supplies, and each lamp branch includes a switch, the opening (switching off) or closing (switching on) of which respectively interrupts or allows the flow of current.

Fuses.—The purpose of a fuse is to break a circuit if, and when, the current exceeds a certain limit. It is usually a soft metal wire, with a low melting-point; and its gauge is such that the wire shall reach that melting-point before the copper conductor which it protects can become dangerously hot. Should, for example, the two conductors of a circuit come into contact, the current would instantaneously increase many times; but in a fraction of a second one fuse or both fuses of the circuit would "blow" (i.e. melt) and the current cease, owing to gaps having been created, before damage had been done. The fuses, therefore, are very important fittings.

If one lamp suddenly goes out, its filament has probably failed. But if several lamps are extinguished simultaneously, one may assume that the circuit fuses, or one of them, have blown. Before the lamps can be used again the fuses must be replaced, and for this contingency a supply of fuse wire of the proper current-carrying capacity should always be kept at hand.

Where the fuse connections consist merely of two screw terminals between which the wire is stretched, *the main switch must be opened* before anything further is done. This will at once plunge the whole house into darkness, and for this reason it is a great advantage to have the fuses mounted inside holders which can be safely removed and replaced without cutting off the current. Some types of holder make the replacement of a fuse a matter of a few moments only.

On no account yield to the temptation to substitute an odd piece of copper or iron wire—such as a hairpin—for fuse-wire if the supply of the latter has run out. To do so might seriously endanger the whole circuit. Keep the ends of the blown fuse as a sample for a fresh supply.

Identifying Fuses.—It is important to know which lamps are supplied through any particular pair of fuses. If the information is not already given on the fuse

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

box, and the fuses are not even numbered, the following course is advised.

First, make sure that there is a lamp in every holder in the house, or at least one to every group controlled by one switch. Remove a fuse at one end of the series in the fuse box (if necessary after switching off the main fuse and switching it on again when the fuse is out). Then go round the house and note which lamps refuse to light up when their switches are closed. Number the fuse and that in line with it on the other side of the dividing rib as No. 1 fuses. The same procedure is followed with the other fuses in order; and finally a list is written out and hung near the fuse box, which will show at once what fuses should be examined when the lights go out in any particular place.

Switches.—All wall switches controlling lights should have a quick-break action, which completes the switching on or off automatically when the knob has been moved part way up or down. This prevents arcing, and burning at the contact points.

If a switch spring breaks, replace the switch. Even good switches—and it is false economy to buy a low-priced, second-grade article—are cheap enough. Before taking off the old one be sure to open the main switch, and so render all circuits "dead." Remove the cap of the switch, and loosen the two small screws which clamp the ends of the conductors into tubular terminals. Next, withdraw the two woodscrews holding the switch to the wall-block. The switch will then come away if the clamp screws have been unscrewed sufficiently.

If possible, the switch should be replaced by one of the same make—if a good type—as its screw holes will match those in the block. If, however, one with screw holes in slightly different positions has to be accepted, fill the old screw holes with small wooden plugs and make new holes.

The ends of the conductors will have been flattened out by the clamp screws, and should be squeezed into a more circular shape with pliers, and the wires be closed up. Any burr on the inside of the terminals, left when the holes for the clamp screws were drilled, should be removed with a small broach or rat-tail file. The conductors will then enter much more easily; when they have been clamped, the switch can be screwed to its block.

Switches in Bathrooms.—These should have porcelain caps and porcelain-covered knobs. Should there be any leakage at the switch, and this have metal cap and knob, a person whose hands and feet are damp after a bath might get a severe shock, especially if the feet are bare.

Lamps.—The "gas-filled" lamp has now largely superseded the vacuum lamp, as it emits a whiter light and is more efficient; that is, gives more light proportionately to the electrical energy used.

The bulb, after being exhausted of air during manufacture, is filled to half atmospheric pressure with gas called argon, which is unable to attack the filament. The last can therefore be raised to a greater heat than would be safe in a vacuum lamp. So intense is the illumination that the bulbs of gas-filled lamps are usually frosted, to scatter the light and protect the eyes from the direct glare of the filament.

Lamps are rated in watts according to the energy they consume: 40 watts, 60 watts, 100 watts, and so on. On every lamp will be found engraved the pressure in volts of the supply for which the lamp is suitable, and the watts needed to run it; for example, "240V—40W."

For the good general illumination of a room, what is called semi-indirect lighting is now much used. A powerful lamp, say, one of 100 watts, is suspended 8 ft. or 9 ft. above the floor at the centre of the room, inside a frosted or semi-transparent bowl. Some of the light comes through the bowl, but most of it is reflected from the ceiling.

Bulbs should be kept clean outside. Dust and fly marks can reduce their efficiency very considerably.

Watts and Units.—The Board of Trade electrical unit is the kilowatt-hour, which signifies a consumption of energy at the rate of 1,000 watts in an hour, or at a smaller rate for a correspondingly longer time. The meter registers the units as they are consumed, and the householder pays accordingly.

A 40-watt lamp will run $\frac{1000}{40} = 25$ hours.

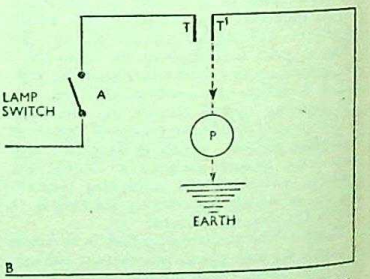


Fig. 2.—Diagram explaining how a person, P, may receive a shock through lamp-holder even when lamp switch has been opened as shown, if current is alternating current. Conductor between A and T is dead, but that between T¹ and B is alive and would give a shock to anyone who touched T¹

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

while consuming one unit, at a cost of, say, 4d. Lamps of higher or lower power than this will keep alight respectively for shorter or longer times at the same cost; a 20-watt for 50 hours, a 100-watt for 10 hours, and so on.

Lamp Fittings.—Lamps are held in holders designed either to be suspended on the end of flexible conductors or to be screwed to the ceiling or a rigid fitting. A holder consists of a brass casing in two parts, held together by a screwed collar, and an internal porcelain base. The base includes two projecting spring terminals, against which terminals in the lamp press when the lamp is inserted.

It is got at by first removing a collar, called the shade ring, and the shade kept in place by the collar; and then unscrewing the second collar, which holds the barrel, to which the lamp is attached by a "bayonet" joint, to the other part of the casing.

The porcelain base has a groove in each side, with which projections in the casing engage, to prevent the parts rotating relatively to each other when the collars are screwed up. When a lampholder is assembled, care must be taken to get these projections into the grooves, as otherwise the lamp will refuse to light up, because the holder terminals will then be out of line with the lamp terminals and will not make contact. Some holders give trouble because the projections are too small to get a proper grip on the porcelain, and the screwing up of collars causes a twist.

Danger of Shock.—In modern house-lighting off a public supply the current usually is alternating current at a pressure of about 240 volts. This pressure is sufficiently high to give anyone who touches a bare "live" conductor, or any metal part connected directly with it, a severe and even fatal shock. The reader is therefore warned to open the main switch before doing anything to any of the electric fittings of the house. Merely opening the wall switch to a lamp, for example, does not make it safe to take the lampholder to pieces.

The facts are explained by the diagram (Fig. 2, p. 564): T T′ are the terminals of a lampholder from which the lamp has been removed; A is the lamp switch, open. The conductor from A to terminal T′ is "dead," as there is a gap in the circuit at each end of it, but the conductor from B to T′ is still in connection with the main and becoming "alive" many times a second; so if a person, P, happened to touch T′, current might pass through him to earth, as indicated by the broken line.

This explanation will serve to show the need for opening the main switch.

It should be added that in private electric lighting installations—plants using direct current—the lamp switches are always in the positive conductors, i.e. those connecting the positive terminals of the dynamo with the lamps, etc. Opening a lamp switch would in this case give protection, as the return conductor (T′ to B) could have no dangerous pressure in it.

The Wiring of Extensions. — Many amateur electricians make extensions from the house circuits into garages, outhouses, etc., so a few remarks on the subject of extensions will be in place.

Assuming that the worker has not the knowledge and skill needed for carrying the conductors through protective metal tubes, or fixing wooden casing, his choice will probably be between cab-tyre-sheathed and lead-sheathed conductors. Either of these two types may safely be exposed to the weather and held in position by staples, which in the case of lead-sheathed wires must be of tinned brass and not of copper.

Lead-sheathed wires must have the sheathing "earthed" by a wire leading to a water pipe or metal plate buried in the ground, as otherwise any leakage from the conductors into the sheathing might give a shock to anyone touching the latter.

For alternating current both conductors should be inside one sheathing, if it is of metal; but for continuous current each conductor should be carried in a separate sheath.

Making branches by soldering wires on to the "through" conductors is permissible only if the soldering is done very thoroughly with a non-corrosive flux and carefully taped over. The parts which will be soldered together should be scraped bright before the solder is applied.

The two systems most commonly used for branching are illustrated diagrammatically by Fig. 3, p. 566. The first of them (Fig. 3*a*) uses junction boxes, which in the sketch are indicated by broken circles. A box contains a porcelain block enclosing brass parts and screws which enable either conductor to be connected with a branch wire running to the lamp or switch. An independent wire, A, connects lamp and switch.

Under the second system, known as "looping-in" (Fig. 3*b*), the through conductors are continuous. Wherever a switch or lamp is to be brought into circuit, a loop in a conductor is carried to it and the wire is bared, twisted into a point, and clamped into the fitting. Then it passes on to the next lamp or switch. Here also an independent wire is needed between lamp and switch.

New Installations.—For a new house

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

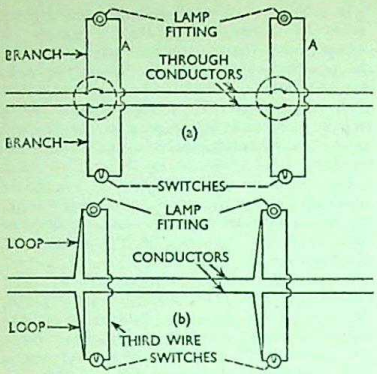


Fig. 3.—Systems of wiring for electric lighting. (a) Junction-boxes (indicated by broken circles) are used here. The conductors end in terminals (solid black, from which branch wires go to lamp and switch, and are carried on beyond box. Short curved lines joining terminals indicate metallic connections. Lamp and switch are joined by separate wire A to complete the circuit. (b) Looping in. Here, main conductors are not put at any point, but are made to call at switches and lamp fittings and then pass on. Here also independent wire connects switch to lamp

that is to be wired for electric lighting the specification should include:

(*a*) The enclosure of conductors in screwed conduits or tubes. These protect the conductors excellently against mechanical damage and damp, and any adjacent woodwork against the risks of fire through short-circuiting or arcing; and give any escaping current an easy passage to earth.

(*b*) Two-point switching for staircase and passage lights, so that lamps may be switched on ahead of and switched off behind the user. Such switching may also be convenient in bedrooms where it is desirable to be able to control a lamp both at the door and from the bed.

(*c*) Isolating switches for each circuit between main-switch and fuses; or, alternatively, quickly removable safety holders for the fuses.

(*d*) That the contractor supply the householder with a drawing showing the positions of all conduits, whether visible or concealed, and indicating what points are supplied from each circuit; and any other particulars that may be useful in case of replacements or additions at a future time.

Even if there is no immediate intention of using electricity for heating or cooking, or for running small household machinery, it may prove economical to have the necessary tubing, and junction and draw-through boxes, fitted while this can be done easily and cheaply. The conductors can be drawn into the tubes when needed, and as current for "power"—which covers heating-purposes—is supplied at a much lower rate than lighting current, there may eventually be a considerable saving.

ELECTRIC LIGHTING PLANT, PRIVATE, THE CARE AND UPKEEP OF.—The four main items of a private generating plant are : (1) the engine; (2) the dynamo; (3) the switchboard; (4) the battery.

As regards the *engine*, if the maker's directions about cleaning, lubrication and the occasional examination of certain parts are followed out, this should give very little trouble. The governor and fuel pump, when once properly set, should not be interfered with. Every now and then the compression should be tested, while the engine is hot.

If it is unsatisfactory, the valves may need grinding in; or, what is more unlikely, new piston rings are required. Valve-grinding should stop as soon as valves and seating show a complete ring of bright metal. In very cold weather, if the engine-room cannot be properly warmed, the water in the cylinder jacket and cooling circuit should be drained off.

Should the exhaust from the engine prove annoying to user or neighbours, an additional silencer should be provided, to allow the gases to cool and contract more thoroughly before reaching the open air. Silencers should be fitted with draining plugs to free them of any condensed water that may collect.

The driving belt should be maintained in good condition and be shortened if it becomes slack. It is less likely to stretch if unshipped after a run.

The *dynamo* needs very little attention beyond keeping it clean and dry, and the maintenance of a proper supply of lubricating oil or grease in the bearings. Dirty bearing oil should be run out and replaced by fresh. When the brushes have bedded down well on the commutator, the most that should be required by these parts of the machine is the occasional cleaning-up of the commutator with a piece of fine grained emery cloth which has already done some work. Anything in the nature of truing-up the commutator should be left to the makers.

The *switchboard* should be kept clean, and all its nuts and terminals be examined occasionally, and tightened up if they need it. It is important that the fuses on it should be of the correct current-carrying

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

capacity. If too small, they are liable to blow; if too large, they will be a danger.

The room in which the *battery* is housed should be separate from the engine-room, and well ventilated. As cells while charging give off hydrogen, a very inflammable gas—as proved by many airship disasters—no naked lights should be allowed in it during, or soon after, charging. It requires good illumination by both day and night, to enable inspection and tests to be carried out in the proper manner. Electric lamps should not be directly over the cells.

It is important to keep the temperature of the battery-room free from extremes. Low temperatures lessen the capacity and pressure of the battery for the time being, while long spells of great heat cause buckling of the plates and excessive evaporation of the electrolyte in the cells. Artificial heating during frost, and thorough ventilation during hot spells, when the room should be opened to the cool night air, are indicated.

All woodwork and metal fittings in the battery-room should be well painted with acid-proof paint as a protection against acid spray from the cells.

The attendant should, as a matter of routine, see:

That all connections of the battery are free from corrosion. Bolts and nuts should be smeared over with vaseline.

That all plates are well covered with electrolyte—diluted sulphuric acid—which should reach ½ in. to ¾ in. above their top edges.

That plates are equal distances apart.

That sediment in the bottom of cells is not allowed to pile up till it touches plates. It should be levelled down by means of an L-shaped glass rod. If this matter is not attended to the cells will soon deteriorate.

Loss by evaporation should, as a general rule, be made good by the addition of distilled water only; or, if this is unobtainable, by carefully filtered rain-water. Water from the main should not be used. Any addition should be made just before beginning to charge. Since water poured into the cell will tend to float on the top of the heavier acid, it should be introduced through a glass tube reaching to the bottom of the cell. While rising it will mix in properly.

As spray from the cells contains some acid, the strength of the electrolyte will gradually fall, and it will become necessary to add more acid. This may be done in either of two ways: (1) Sulphuric acid of the quality used by the makers of the cells is added to distilled water until a specific gravity of 1215° is shown by the hydrometer. This is added in place of pure water just before a charge. (2) Strong acid of 1300-1400 specific gravity is added a drop at a time and stirred in with a wooden paddle. This should be done towards the completion of a charge.

Keeping Cells in Good Condition.—In a fully charged, healthy battery the positive plates have a chocolate colour, and the negative plates are of light or bluish grey. Any deposit at the bottom of a cell should be brown. The cells will not give off gas during discharge or when idle—except for a short while after a full charge; and during charging they will all begin to gas at about the same time.

Bad signs are: a whitening of the plates (sulphating); premature gassing of the plates during a charge at normal rate; excessive shedding of deposit. The first is due to insufficient charging, or leaving the battery idle too long.

Premature gassing may be caused either by the plates being worn out by use, or by sulphating checking the chemical changes which take place during charging. Deposit is shed at an abnormal rate if the charging-rate is too high or the cells are allowed to exhaust themselves too far during discharge.

Like a living creature, a battery requires some exercise to keep in good condition. Sulphating—which is the cause of most battery troubles—can be prevented if the battery, during normal use, is charged at regular intervals, given an extended charge—with full gassing for 45 minutes—once a fortnight and never allowed to over-discharge itself or stand quite idle for long periods.

During the summer, when lights are little used, and radiators not at all, it will do the battery good to make it discharge for periods through the artificial resistance at least half its full ten-hour discharge rate. The chief engineer to a leading firm of accumulator makers recommends the following simple method:

Two lead plates, having an area of about half a square foot each, are suspended from wooden bars in a barrel filled with water. The plates are connected by cables with the terminals on the double pole discharge switch, on the side remote from the battery cable connections. The plates having been set about 6 in. apart, the switch is closed. At first the current passing will be very small, but the addition of sulphuric acid drop by drop and stirring it in will increase the current to any desired figure.

An alternative is to pass the current through resistance wire wound on some heat-resisting substance such as firebrick. The formula to be used is $R = \frac{E}{C}$, where

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

R = resistance, in ohms; E = the voltage of the battery; and C = the current desired in amps. Thus, assume E to be 50 volts, and half the maximum discharge rate to be 20 amps, the resistance required would be one of 2½ ohms.

This would be provided by 25 ft. of a resistance wire with a resistance of .1 ohm per foot.

Testing by Hydrometer.—While a cell is being charged, the electrolyte becomes denser, and conversely during discharge it becomes more dilute, and lighter. These changes are due to chemical changes and the interaction of plates and electrolyte, and they afford a ready means of deciding how far a cell has been charged or discharged; or, in other words, how much useful charge it has left in it.

At the beginning of a charge the hydrometer floats with, say, the 1175 mark on its neck level with the surface. As the electrolyte becomes heavier more and more of the neck emerges until, when the cell is gassing vigorously and showing signs of full charge, the figure may have changed to 1215. The electrolyte has thus gained 40 points in density. During discharge, by the time the specific gravity has fallen to 1195, half of the charge put in has been used; at 1185, three-quarters; and at 1175 the cell is back to its pre-charging condition.

When the specific gravity sinks to a certain point—which varies with different batteries—the battery should at once be recharged. Once the full charging range in specific gravity is known, a hydrometer is, under normal conditions, an accurate index to charge state. The whole battery should be gone over with the hydrometer now and then, to find out whether all the cells are behaving alike.

Test by voltmeter.—The switchboard voltmeter, which can be connected with the battery discharge circuit, also gives some indication of the battery's condition as a whole. (But it is of value only when the battery is discharging at a fair rate. At no load an almost exhausted battery may show full voltage.) If the reading falls to an average of 1.85 volts per cell, recharging is needed.

The voltage of each cell should be tested occasionally (again during discharge) with a special cell-testing voltmeter (the ordinary cheap instrument is useless), and a record kept. In this way any weak cell will be detected, even though the specific gravity may be correct.

Putting a Battery out of Commission.—If for any reason a battery is to lie idle for a prolonged period and recharging is not possible, it must be dealt with as follows:

First, it is charged until the plates have their normal colour; and then charged again after rests of an hour, until gassing begins as soon as charging commences.

Secondly, the cells are disconnected.

Thirdly, positive plates are drained and negative plates immersed in clean water.

Fourthly, the negatives are drained after soaking 24 hours. If they heat in drying, they should be soaked again.

Fifthly, the cells are emptied, washed out, and dried.

Sixthly, the plates are put back into the empty cells, which are covered over to exclude dust.

If all this is done carefully the plates will be good for future service. On the other hand, a battery that is merely left to stand will ruin itself by sulphation.

ELECTRIC LIGHT SWITCH, AUTOMATIC.—Where a cupboard or storeroom is provided with an electric light controlled by a switch outside the door, it is easy to forget to switch off after the door has been shut and, with no light visible to warn one that the lamp is still burning, a considerable amount of current may be wasted. The obvious preventive is to make the act of closing the door work the switch automatically.

A simple method is to run a cord from the switch through an eye screwed into the door frame almost level with the top of the door, and to fix the other end to a second eye placed level with the first and about a foot from the hinge edge. The length of the string should be so adjusted that sufficient tension is put on the string to operate the switch before the door actually shuts.

Since string is sure to stretch sooner or later and need readjustment, part of the string may advantageously be replaced by a long spiral spring, which will be extended sufficiently by the closing of the door to move the switch. The screw-eye through which the cord passes should be of good size, to prevent wear at the angle.

The arrangement described assumes the switch to be on the hinge side of the door. Should, however, it be on the closing side, three guides will be needed to take the cord across the top of the door and down to the correct level. In such a case it would be advisable to use pulleys near the top corners of the frame.

FENCES AND GATES, GARDEN.—The cheapest form of fencing, after plain post-and-wire, is that of split chestnut, sold ready for fixing in long lengths by many timber merchants. The wire spacing the bars and holding them together is stapled at intervals to posts, upon the durability of which largely depends that of the fence. The posts sold with the fencing often err on the side of flimsiness. If the wire has been poorly galvanized.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

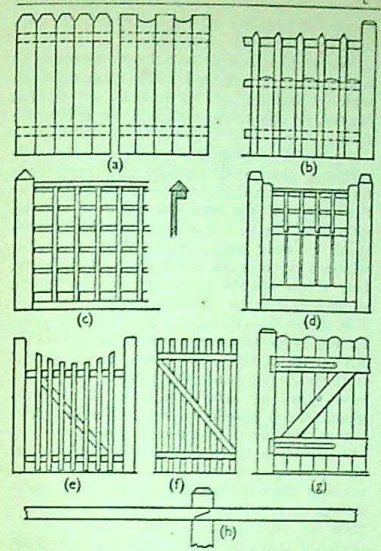


Fig. 1.—Fences and gates. (a) Closed board fences. (b) Partly open fence. (c) Lattice fence. (d) Framed gate. (e, f) Openwork gates. (g) Ledge-and-strut gate. (h) Showing how the ends of a pair of rails should fit together inside a mortise

rust will shorten the life of the fence considerably; so it is worth while paying a bit extra for good galvanizing. The fact that a fence of this kind is "wobbly" makes it difficult to climb.

More permanent fences have a framework of posts and horizontal rails, and to the outer face of the latter vertical boards are nailed to give a "closed" fence (Fig. 1*a*) or spaced bars for an "open" fence. Or boards and bars may be alternated, the former reaching only part way up, as in Fig. 1*b*, to give a more ornamental effect.

Many closed fences are made of overlapping split oak shingles or deal weatherboards. If the top of a closed fence is not ornamented in any way by being notched (Fig. 1*a*) or cut into curves, it may well be surmounted by a triangular capping (Fig. 1*c*) which gives it a finish and prevents rain soaking into the end grain.

Another popular form of fence is shown in Fig. 1*c*. Here laths of deal or oak are fixed to form a square lattice, which, if the mesh is fairly small and the fence of good height, can be used as a trellis to attach roses, clematis and other climbing plants to. In another form, which has become rather popular, the fence is made practically closed by interweaving wide, thin laths of cleft oak.

Whatever form of fence be selected, the stability and permanence of the posts should be a first consideration. How many wooden fences does one see which have been ruined by their posts giving way! If oak posts (with good butts) have to be ruled out as too expensive, trouble should not be spared on making cheaper posts as rot-proof as possible to a point some inches above ground level. The simplest way of doing this is to soak the bottom ends in creosote.

Get some drain pipes of sufficient length and internal diameter, plug their small ends with an inch or so of sand-cement mortar, sink them vertically in the ground, stand the posts in them, and fill up with creosote. As the creosote sinks, add more, until absorption ceases. If the first filling is done with hot creosote, so much the better.

The rails also should be of oak, if possible. Those sold for the purpose are usually three-cornered, the widest face going against the boards or pales. At the ends they are reduced to meet in mortises cut in the sides of the posts. The bottom rail should be well above the ground and a small space be left between the boards and the earth, to prevent moisture soaking up into the wood.

Mortises are started by boring holes with a bit top and bottom, and are cleared out with a chisel. When the first post is in position, insert one end of the rails into it, then knock the next post over the other end, fill in the hole, and so on. Stretched strings and a plumb-line are used to get the posts in alignment top and bottom and

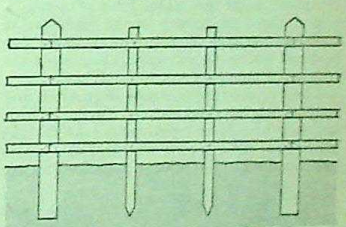


Fig. 2.—Strong fence for keeping out cattle

vertical. Fix rails into posts with trenails; and use galvanized nails for fixing on oak boards or pales, since oak soon rusts iron.

Gates.—The "open" gates illustrated by Fig. 1*e* and 1*f* are made by nailing 2-in. and 2½-in. palings together, and are the cheapest possible form of gate. Another quickly-made type is the ledge-and-strut

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(Fig. 1*g*), which is considerably more substantial than the preceding. Fig. 1*d* presents a framed gate, with open upper part. The boards may be grooved into the rails and stiles, or nailed into a rebate made by nailing slips on the inside of the stiles and rails. If the boards make a tight fit they will do the work of a strut in preventing the gate dropping at the latch side.

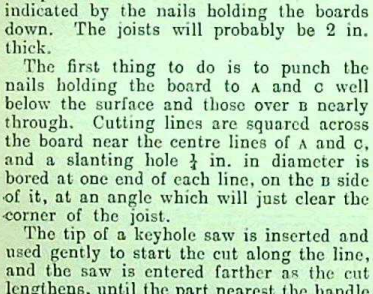
A strong fence for keeping out cattle is shown in Fig. 2 (p. 569). Main posts are 7 ft. long, and 7 in. by 3 in. in section; the intermediate posts of 3½-in. by 2½-in. stuff. The posts are 3 ft. apart, centre to centre, and go 2 ft. into the ground. Rails of 3½-in. by 1½-in. wood are nailed to the outside faces, being spaced 11 in., 10 in. and 8 in., reckoning downwards. The main posts are erected first, and the rails nailed on. The intermediate posts are then driven in, in contact with the rails, and their tops trimmed off. The main posts are bevelled at the top, as shown.

FLOOR, MAKING OPENINGS IN.—It may be necessary to get at a pipe, wire, or electric-light fitting situated between a floor and the ceiling below, and to do so will entail removing a board or boards.

We will assume that part of a board has to be freed between joists A and C in the diagram. The run of the joists will be at right angles to that of the floorboards, and the positions of their centre lines will be indicated by the nails holding the boards down. The joists will probably be 2 in. thick.

The first thing to do is to punch the nails holding the board to A and C well below the surface and those over B nearly through. Cutting lines are squared across the board near the centre lines of A and C, and a slanting hole ¼ in. in diameter is bored at one end of each line, on the B side of it, at an angle which will just clear the corner of the joist.

The tip of a keyhole saw is inserted and used gently to start the cut along the line, and the saw is entered farther as the cut lengthens, until the part nearest the handle can be used. Care must be taken to cut along, or parallel to, the marked line, and to keep the angle constant.



Making an opening in a floor. Heavy broken lines show angle at which the saw is sloped sideways while cutting. Fillets are nailed on before the board is replaced

When the board has been severed at both ends, it is prised loose from B, from which the nails are extracted; or, if this cannot be done, they should be driven in flush.

Its ends having been cut slanting, the released part will overlap the parts left fixed; but since it has been shortened by the width of the two saw-cuts, it will be able to tilt on B. In a case like this, where there is only one intermediate joist, or where a piece is cut out between two joists, four fillets should be nailed to the joists, as shown, for the board to rest on.

If there is any likelihood of the piece having to be taken out again, it should be secured by screws, not nails, those at the ends sloping towards the joists. The holes bored for the saw should be filled in—plastic wood should be used if available—before the board is screwed down.

Patching a Worn Floor.—The old boards can have pieces cut out of them in the manner already described. The new parts will need bevelling at the ends to make a tight fit. Alternatively, the board may be chiselled through over joists. A V-shaped groove is formed, with a vertical face on the line of the cut and the other sloping towards the waste, in which it is widened until the joist is reached. The new board will be able to bed firmly on the joists at its ends.

FORCE PUMP, AN EASILY MADE.—The construction of the simple but effective little pump illustrated on p. 571 is a carpentering rather than an engineering job, and should be within the compass of any handyman's abilities. The pump has no metal parts whatever, except a few screws, pins and washers.

Diagram *a* is a side view of the pump as it would appear if the body were cut lengthwise down the middle. In *b* is a plan view of the complete pump, as seen from above. Diagram *c* shows the shape of the two supports, A and B; and *d* that of the plunger.

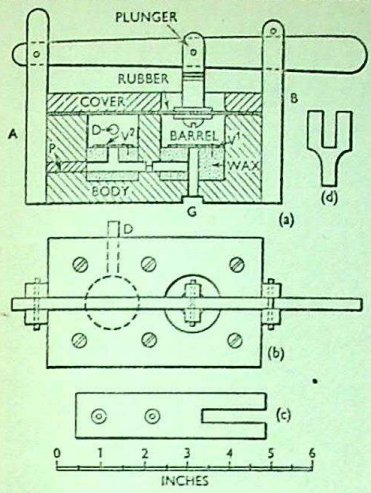
Two blocks of hard wood—beech or oak—5 in. long and 3 in. wide are needed. The body piece is 2 in. thick, and the cover piece ¾ in. thick. Both are planed up smooth and true, and they should make a good flat fit when placed together.

To ensure a neat job, it is better to make the cover a little larger, secure it to the body by six screws (as shown in diagram *b*), and plane the edges down to the exact size of the body. The screw-holes in the cover must be large enough for the shanks of the screws to pass through them freely.

The cover having been fixed to the body, a hole 1¼ in. across and 2 in. deep is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Simple but efficient model pump. a) Side sectional view. (b) Plan view. (c) End piece for handle. (d) Plunger

bored with a centre-bit, centred $1\frac{5}{8}$ in. from one end, through the cover into the body. The lower part of this forms the "barrel" of the pump. The cover is then removed, and a $1\frac{1}{4}$-in. hole, centred $1\frac{1}{2}$ in. from the other end, bored to the same depth. Melted paraffin wax is then poured into the holes to a depth of $\frac{3}{4}$ in. or so, and flattened down while warm with a metal disc—a worn coin does very well.

A horizontal hole, H, is drilled, as shown, and plugged with a wooden plug, P. Central holes are drilled through the wax to connect barrel and delivery valve chamber, that in the barrel being continued into a groove, G, cut across the bottom of the body.

The valves v^1 and v^2 are circular patches of thin sheet rubber, pinned into the wax. A delivery hole, D, is bored through the side of the body for the delivery pipe (D in diagram *b*).

This pump has no piston, its place being taken by a stout rubber diaphragm, which is part of a sheet of the same size as the blocks. A piece cut from an old inner tube of a car tyre does excellently. The rubber is pinched tightly between cover and body by the six screws. To prevent it being cut, the edges of the barrel and cover should be rounded off.

The diaphragm is secured to the end of the plunger by a round-headed screw, passing through washers on each side of the rubber. The edges of the washers should also be rounded off.

To prevent water swelling the parts, it is advisable to soak them all in hot melted paraffin wax, before the wax is introduced into the large holes. The inside of the latter should be liberally coated.

FRETWORK.—Fretwork, when carried out in good materials from good designs, can be highly artistic, especially when it embraces inlaying and overlaying with metals, xylonite and other hard substances with which the fretsaw is able to deal. To carry it out in a pleasing manner requires a good deal of practice and much care.

The Outfit.—The best *saws* have well-spaced teeth, Figs. 1*a* and 1*b* (p. 572), so as not to clog. Nos. 1, 2 and 3 are the sizes most widely used. For hand-cutting the saw is held in a *hand-frame* (Fig. 1*c*), which should have tightening screws in both the handle and the top arm, and measure 12 in. to 14 in. from saw to back.

Anyone who intends to do much work may well invest in a *treadle-saw* which, being worked by the feet, leaves both hands free to guide the wood. Moreover, it ensures a vertical cut, so hard for the beginner to achieve; cuts much quicker; and enables cutting to be done to any bevel. The last quality is invaluable in connection with inlaying.

As holes should always be drilled, not bored with a bradawl, the outfit must include a *drill* of some kind, such as those represented by Figs 1*d* and 1*e*. For hand-cutting, a *cutting-table*, which can be clamped to the edge of an ordinary table, is essential; one measuring 12 in. by 9 in. (Figs. 1*f* and 1*g*) will be suitable, and is easily made at home. Two slots are sunk into the rear end, so that the top of the clamps, which pass through holes at the inner ends, shall be below the surface.

Other accessories are: wire-cutting *pliers*, *carbon paper* for tracing, very small brass *screws* and wire *nails*, liquid *glue*, fine *glasspaper*, and a few special fretwork *files*.

Fretwoods.—The usual thickness for ordinary small work is $\frac{1}{16}$ in.; and for larger work, $\frac{1}{8}$ in., $\frac{5}{16}$ in. or $\frac{3}{8}$ in. For overlaying, select $\frac{1}{16}$ in. or $\frac{1}{8}$ in.

Satin walnut takes first place among fretwoods in popularity, on account of its pleasing brown colour, soft grain and cheapness. Its one fault is its liability to warp. It can be obtained in good widths. The favourite dark wood is *dark walnut*, a richly coloured wood, hard, but not difficult to saw. *Birch* is an excellent wood for medium tints. *Holly* wood is a very pure white and the best for use in overlaying. *White chestnut* is a very fair substitute for holly, and a good word may

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be said for *white maple*. Figured *oak* is handsome and suitable for large work, but needs very careful cutting and cleaning. For small articles one may select *satinwood* among yellow woods. It is closed-grained, slow to cut, and expensive, but very handsome. In the last three respects it resembles *rosewood*, the most beautiful of all the hard woods.

Silverwood, so generally useful in fretwork, is maple or sycamore stained a very pleasant silver-grey. *Plywood*, if specially prepared for fretwork, with all plies of the same colour, is useful, on account of its toughness, for intricate and delicate work; but ordinary plywood should be avoided for high-class work.

Boards exposed to alternations of heat and moisture are very likely to warp. Do not soak them when attaching or removing a pattern. A warped board should be damped on the hollow side and have its rounded side held near a fire until it straightens out, when it should be put under pressure to dry.

Designs.—There is little excuse nowadays for working to bad designs, as the amateur has a wide choice of good ones. A good design will leave no very weak places in the fret; has artistic merit, based on graceful outlines; and, when executed, will leave the worker in possession of an article which is at least nice to look at, and may be practically useful as well.

Designs are lithographed on thin paper. A design may be pasted direct to the wood; or, if required again, be traced on to the wood with carbon paper.

Pasting enables the worker to cut direct from the original and not from a copy, at the cost of destroying the pattern. When pasting, be careful neither to moisten the wood sufficiently to make it warp, nor to distort the design when rubbing the paper flat. Use flour or starch paste—not gum—applying it rather to the wood than the paper, and rub down quickly. A little adhesive applied to the back of the wood will balance moisture on the papered side.

Tracing a design is tedious work, but it saves removing the paper, and leaves the design uninjured. Pin the design on top of a piece or pieces of carbon paper as large as itself, and use a sharp pencil. Circles and arcs, etc., should be drawn with compasses and all straight lines ruled.

Whether pasted or traced, a design should have its larger dimensions in the direction of the grain, to minimize warping troubles. And, if one side only of the fret will be visible, have the design on the better surface, so that the burr left by the saw shall be on the worse and unseen side.

Drilling.—Clamp the wood to the bench or a piece of waste wood. Locate holes in the waste near convenient points or angles. Hold the drill quite vertical; and keep it running while drawing it out of the wood. This will prevent the drill-point being snapped. After drilling, sandpaper the wood free of the roughness left where the drill has come through.

Adjusting the Saw.—A saw is fixed in the frame with its teeth pointing downwards, the direction in which a fretsaw should cut. The saw should be securely gripped in the clamps, for tightening which a big nail or a pair of pliers is used, and be well stretched. A slack saw is much more likely to break than a taut one. The beginner must be careful while and after clamping the bottom end of the saw after passing it through the wood, as a careless movement may snap it.

Cutting by Hand.—Tilting the saw sideways bevels the cut; tilting it forwards or backwards damages angles. It must therefore be kept vertical to get clean work, and to do this will tax the beginner, who is strongly advised to practise on simple designs before attempting anything elaborate.

The strokes must be even, short and gentle. The part being cut is kept above the V in the cutting-table, and the more

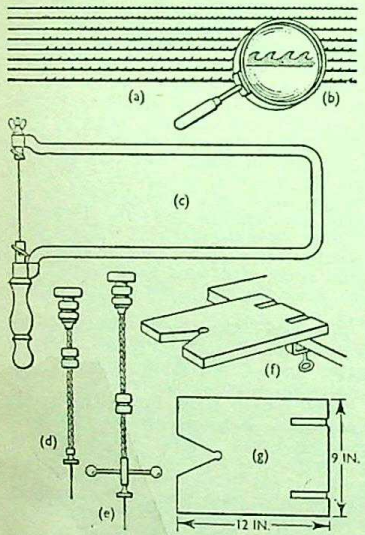


Fig 1.—(a) Fretsaw blades. (b) Teeth of best form of saw. (c) Hand fretsaw frame. (d) Archimedean drill. (e) Continuous cutting drill. (f, g) Cutting table.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be to an edge of the V. The work is turned to meet the saw, but most of the steering is done by the worker.

Machine-cutting.—When a treadle-saw is used, the saw cannot alter its position, and if the cutting-table is adjusted correctly the cut is always vertical. The work has to be both fed up to the saw and guided by the hand. The beginner is cautioned against running the saw too fast when cutting thin or soft wood.

Hints on Cutting.—Accuracy of cutting should always be striven after. The worker must never forget that the finished article is the part left in, not the part cut away. The saw must therefore always be in the waste, but as close up to the pattern as it can be kept.

Figs. 3*d-g* (p. 574) show the effect produced by allowing the saw to stray from the right path. In *Fig. 3d* the design has been cut correctly; in *Fig. 3e* the saw has been allowed to get inside the pattern line; in *Fig. 3f* it has strayed too far into the waste; and in Fig. 3*g* it has been used carelessly, and details are blunted and lacking in spirit.

When cutting circles or ovals the saw should approach the cutting line at a very acute angle, so as to enter it neatly (Figs. 2*a* and 2*b*). To start a square or triangle the saw may begin at a corner (Figs. 2*c* and 2*d*).

In hard cutting special care must be taken when sawing delicate parts, which should be kept above the circular hole at the apex of the V in the table. Do not press the saw hard against the wood where there is danger of snapping; and be on guard against leaving a heavy piece of waste hanging on to a weak neck.

An illustration, Fig. 2*f*, gives an example. Here the shaded scrolls are connected by narrow necks with the rest of the design. If in cutting one out the saw is started at X and carried round to Y and Z in the direction of the arrows, a large piece is left hanging on to the scroll.

When the cut is completed from Z to X, the weight of the waste will tend to pinch the saw and the friction may snap the neck. The proper course is to cut from Z to X first, and then from X to Y and Z along the arrows, thus separating the fragile part from the waste before the latter can do any harm.

In large work one is often up against the difficulty that the work cannot be turned through the frame of the saw. Take for instance the opening O in Figs. 2*g* and 2*h*, near the end of a large piece, the other end of which projects beyond the back of the frame. Suppose that the cut is started at H and carried to I J K and L. When an attempt is made to turn the saw

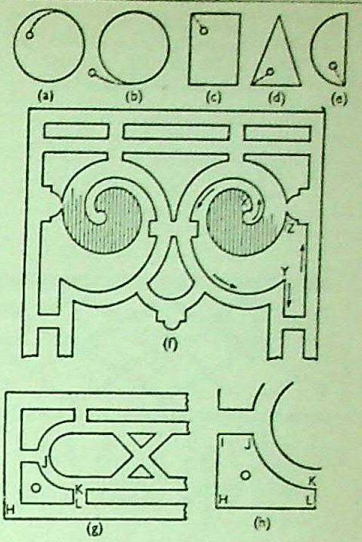


Fig. 2.—(a to e) Where to start for cutting different forms. (f) Cutting a delicate neck. (g) Cutting openings at the end of a long fret. (h) Enlarged detail of (g)

or the wood so that the line L-H may be cut, the wood and frame come into contact, and the saw has to be worked back to H, for the final cut to L. The quicker and better course is to cut H to L, then retract the saw; and finish by way of I J and K.

Corners and Points.—When a saw has cut into a corner, it is the best practice to approach the angle along the converging lines in turn, as this produces a perfectly clean corner. If, however, it is not possible to do this, the saw must be turned in the corner after the completion of one cut, to take up a new direction. In such a case the saw should be moved slowly up and down without cutting till the turn has been made.

When cutting a point or outside angle, the saw, after running up to it along one side, should be carried on into the waste and describe a circular course which brings it back into the correct line for the second cut. Carelessly cut corners and points mean much cleaning off with the file to get things right.

Ties.—Like stencils, frets are held together by ties. But whereas in a stencil the cut-out part is the design, in fretwork it forms the design. Consequently stencil ties divide the design, while fretwork ties

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

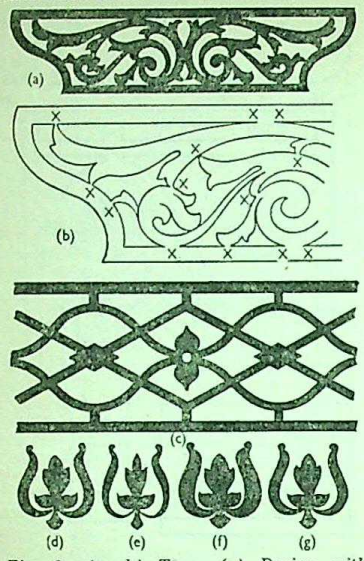


Fig. 3.—(a, b) Ties. (c) Design with intersections. (d) Leaf form or ornamentation, correctly cut. (e, f, g) The results of various faulty treatments of (d)

bind it together, and give it mechanical strength. In cutting, their importance should always be kept in mind.

Fig. 3*a* is a design with ties blending naturally into it. In the enlarged part of the design shown in Fig. 3*b* the ties are marked by x's. When working up to them the saw must not be carried too far into the corners, or the ties will be weakened. On the other hand, they will be too thick and appear clumsy if the saw stops too soon.

In many designs ties take the form of intersections (Fig. 3*c*) and form part of the ornamentation. When approaching an intersection the eye must be kept on the continuation of the line beyond it, for any lack of continuity of line will be very obvious.

Duplicate Cutting.—Two similar frets can be cut simultaneously if two pieces of wood are nailed together and treated as a single piece, which for hand-cutting should not exceed $\frac{3}{8}$ in. in thickness, though stouter work may be sawn on a treadle-machine. The pieces should be nailed firmly outside the edges, and here and there through the waste, to prevent vibration and ragged cutting.

Though duplicate cutting is slow work, in the end it saves a good deal of time in tracing, drilling and shifting the saw. It also, in some cases, avoids the expense of buying two copies of the design; but hand-cutting requires special attention to keep the saw vertical, as any slant will produce dissimilarities in the two frets.

Removing the Pattern.—A pasted-on pattern should be removed by sandpapering, rather than by damping, as moisture promotes warping and roughens the grain.

Filing and Cleaning-up.—Used as a corrective, filing is a sign of faulty cutting, but on some woods it is needed for removing the ragged edges left by the saw. When using a file, be careful to hold it squarely to the work, so as not to round off the sharp edges of the fret. The various sectional shapes of fretwork files are shown in Fig. 4*b*. A set including all shapes will cope with angles, curves and straight lines.

After filing, the work must be thoroughly rubbed with fine glasspaper, wrapped round a flat rubber, travelling along the grain always, never across. Next, the edges of all openings require attention. Fibres left where the saw has cut along the grain are removed by folding a strip of fine glasspaper round a strip of thin wood and using this as a file. This job

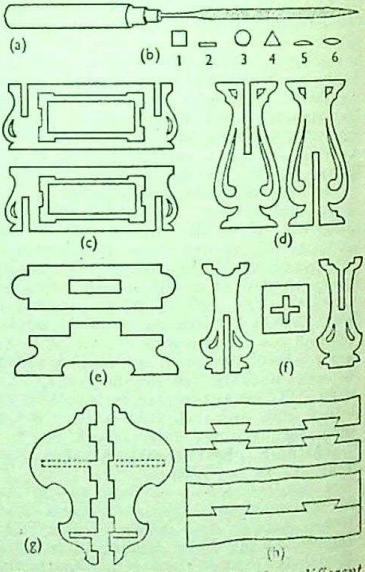


Fig. 4.—(a, b) Files, showing different sections. (c, d) Halved joints. (e) Mortise- and tenon-joint. (f) Halved- and tenoned-joints. (g) Lap joint. (h) Dovetail joint

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

must not be scamped, as the general appearance of a fret will be marred if edges are left ragged.

A final rubbing of the sides with well-worn glasspaper completes the cleaning process..

Fretwork Joints.—Those commonly used are shown in Fig. 4. They are cut with the fretsaw as part of the actual design.

The *halved joint* (Figs. 4*c* and 4*d*) is used for joining the sides of boxes and other four-sided articles, or for uniting two parts centrally. The *mortise and tenon* (Figs. 4*e* and 4*f*) is employed for fixing upright parts to a base. Cut close and glued, they make a very strong joint. The tenon should be cut a bit long, so that after gluing it may be planed down neatly. The *lap* joint (Fig. 4*g*) is a favourite for the back edges of a corner bracket. The *dovetail* joint (Fig. 4*h*) is another favourite for holding two parts together edge to edge in the same plane.

Staining and Polishing Fretwork.—Staining is seldom needed, as woods are generally chosen for their natural colour. If done, it must be followed by polishing. Varnishing should be avoided for finishing small work, though it is often employed for large work, such as screens.

Wax polishing is the easiest and most satisfactory for amateur use. The polish, which consists of shredded beeswax dissolved in turpentine until of the consistency of soft butter, is applied with a brush or rag, and well rubbed with flannel or chamois leather. The surface produced is marked by water, but this can be restored very quickly by a part application of the polish.

Oil polishing gives beautiful results and a permanent surface, but needs a very great deal of "elbow grease." The polish is made by raising raw or boiled linseed oil almost to boiling point, and adding about an eighth part of its bulk of turpentine after it has cooled. Many applications, with the aid of felt or flannel wrapped round a wood block, and bouts of rubbing are needed, as the oil keeps sinking in, before a good surface is produced.

Fretted oak articles can be darkened by exposing them to the fumes from liquid ammonia in a sealed box.

GARAGE, BUILDING A.—The conveniences of having a motor car to use are seriously lessened if the car has to be housed in a public garage, or in a hired lock-up garage some distance away. And the oftener the car is needed, the more is the handicap felt. The expense of garaging works out in most towns at a sum which appreciably increases running costs.

From the financial point of view alone it is worth while spending a sum of £100 to £150 on erecting a garage on one's own premises, as the interest lost on the capital sum will be saved two or three times over in out-of-pocket expenses. Moreover, a garage may add to the value of premises more than its own cost, and in these days, when so large a percentage of people are car-owners, render a house much more saleable.

Apart from pecuniary considerations, a garage enables the car-owner to carry out many little repairs and adjustments; and to do other jobs, such as oiling and cleaning, from which he is barred in a public garage.

The wealthy person, with plenty of room and money at his disposal, will call in an expert or good local builder, state his requirements, and leave the design and erection to him. We are concerned here with the needs of the person of moderate or small means, requiring a garage for one car.

Cost.—Where this has to be cut down to a minimum, the choice may lie between a ready-made portable garage, built in sections, and quickly erected, and a wood-framed structure built locally and covered with asbestos, corrugated iron, or wood, and lined inside with matchboarding to increase its warmth in winter and coolness in summer. As a protection against weather, either may prove quite satisfactory; and either qualifies as a tenant's fixture if not attached permanently to the ground.

In urban districts, however, the by-laws may frown on such garages, and insist that one ranking as a temporary erection shall, if framed in wood, have the woodwork protected against fire inside and out, or at least inside, by asbestos sheets. The prospective garage-owner should therefore acquaint himself with the conditions imposed by the local authorities before coming to a definite decision.

The brick-walled garage is undoubtedly the most expensive form. But when erected such a garage is the most satisfactory, as regards both appearance and exclusion of undue heat and cold. It is necessarily a fixture, and as such adds a little to the rateable value of the premises on which it stands.

Design.—This will to a certain extent be controlled by circumstances. A completely detached garage usually has a gable roof. A cheaper alternative is a flat roof sloping from the front to the rear, where, owing to the absence (usually) of doors, less height is needed. A flat roof enables straight beams to be substituted for more costly trusses. But if a covering of slates or tiles is desired, it is ruled out by the insufficiency of a slope which would

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be steep enough for corrugated iron or asbestos roofing.

In some cases the garage may be erected, with some saving of expense, against the house, with roof sloping away from the latter or fore and aft. Only two walls will be needed, and in winter it will benefit from the warmth of the house wall: and, if on the south side of it, by protection from cold winds.

Dimensions.—Where there is ample building space available, and the garage is to be a permanent structure, it should be at least 17 ft. long and 9 ft. wide inside. This will give room for passing freely all round a good-sized car when the doors are shut, even if the car has not been quite correctly centred. An extra 4 ft. of length or 2 ft. of width will enable a work-bench —a very desirable fitting—to be placed at the inner end or on one side respectively. There will then also be plenty of room for shelves, cupboards, heating apparatus, and other conveniences.

Bearing in mind that the cost of a garage does not increase proportionately with size, the owner of a small car would be well advised to allow in advance for the possible possession of a larger car in the future. The cost of enlarging a garage is much greater than the extra cost of making it, in the first instance, ampler than present needs demand.

Floors.—By far the best flooring material for a garage is concrete, faced with carefully floated cement mortar. It is easily cleaned and is, or should be, very durable, and contains no crevices in which dropped screws, etc., can hide themselves. The concrete should have under it a layer of well-rammed brickbats and stones, and be at least 4 in. thick.

To shed any water which may leak from the car, or blow in through open doors in wet weather, it should have a very gentle fall of, say, 2 in. in 15 ft. towards the door end.

Should the approach slope down towards the garage, an intercepting gutter should be formed in the concrete just outside the door.

Doors.—Though many garages continue to be fitted with folding doors of the ordinary type, sliding shutters moved either vertically or horizontally across the entrance are becoming increasingly popular. The reason for this is partly that opening and closing them causes no obstruction outside the garage. Where folding doors are used, they cannot be opened when the car is close to them, a fact which at times and in some positions may prove very inconvenient.

The roller-blind type of shutter has steel or wooden slats running in grooves in the framework. The slats overlap in a manner which prevents rain getting through. The jointed horizontal shutter running on rollers and rails has the advantage over the roller-blind type of staying definitely in any position, intermediate between full open and closed.

The entrance to the garage should, if possible, be wide enough to make very accurate steering unnecessary, and to make it easy to get past a car partly in the garage. A width of 8 ft. is recommended for large cars and one of 7 ft. for cars of medium size.

Roofing.—Corrugated iron, if used, should not be bare on the inside, as in certain conditions of weather moisture will condense on it and drip.

It should be laid on matchboarding, which will prevent this "sweating" and check the entry or escape of heat. Or, as an alternative, the boarding may be on the inside of the rafters or purlins, and the intervening space be packed with slag-wool, which is an excellent non-conductor of heat.

A third course is to use boards directly under the roofing, and to cover the rafters inside with asbestos sheets, which, besides insulating, help to protect the woodwork in case of fire.

Corrugated asbestos sheeting is superior to corrugated iron as regards freedom from "sweating" and corrosion, and it keeps heat and cold out much better.

The rain-water from the roof should be collected in a tub having an overflow to a drain, as it is the best possible to use, after filtering, in the radiator of the car, which cannot become furred up if clean, soft water only is put into it.

Lighting.—No garage should depend entirely for lighting by day on the doorway. At least one window should be provided—and if only one, it should open—to assist ventilation.

If there is a work-bench, it should have a window over it, and this should preferably face north, so as not to admit direct sunlight. Plenty of light in a garage is a great advantage. Illumination will be greatly improved if woodwork is painted, and brickwork distempered white, to scatter light into corners. If a skylight can be included conveniently in the roof, so much the better, as light from overhead is very valuable for some operations.

The only safe and efficient light to use after dark in a garage is electric light. If the house is lit electrically, conductors should be carried from it to the garage. Besides fittings for overhead lamps there should be wall-plug sockets on each side, well above the floor, for inspection or heating lamps or for battery charging.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Heating.—Except in very cold weather, it is comparatively easy to keep frost out of a brick-built garage by means of a hot-water radiator supplied from a gas-heated boiler outside, in a small chamber of its own. Or one of the slow-combustion "safety" stoves, made specially for the purpose, or an electric radiator of the lamp type, may be used inside.

If, however, the walls are of thin material, it may be necessary to concentrate on the radiator and engine, if draining the radiator or filling it with anti-freezing mixture is to be avoided. An inspection lamp or a safety oil-heater placed inside the bonnet, and rugs hung over bonnet and radiator, will exclude frost; but an unheated garage is a very uncomfortable working-place in cold weather.

Ventilation.—The garage should have a ventilator in or near the highest part of the roof, and it should be possible to close this in frosty weather, to prevent the escape of heat. An opening window at the end away from the door is desirable, to give a through current of air.

A warning should here be given against the danger of running an engine, to test or warm it up, inside a garage with the doors shut; or even when they are open, if the car has been run in stern first. The exhaust gases contain the extremely poisonous carbon monoxide, the inhaling of which may even prove fatal.

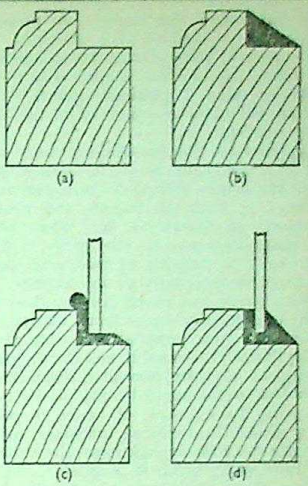
Precautions Against Fire.—Every garage must be provided with a chemical fire extinguisher—maintained in proper working order, be it noted. The use of this in the early stages of a conflagration may smother the flames before any serious damage has been done.

A bucket or two of sand, wet sawdust, or fine earth should also be kept at hand, ready to throw on blazing petrol spreading about the floor. *Note.*—It is worse than useless to throw water, as the lighted petrol will merely float on it and be the more quickly distributed.

The painting of exposed woodwork with a good fireproofing paint is to be recommended. The paint at least delays ignition, and may prevent a small outbreak developing into a serious conflagration.

Washing-platform.—This should be surfaced with cement or asphalt, and slope sufficiently towards a central gutter or drain to free itself quickly of water.

GLASS AND GLAZING.—Window glass is sold by the square foot or, in large quantities, by the 100 sq. ft. Its thickness is indicated by its weight in ounces per square foot. For small panes 15-ounce glass, about $\frac{1}{16}$ in. thick, may be used; for large panes it should be 21-ounce, or about $\frac{1}{8}$ in. thick. Where panes are large and great strength is needed, 26-ounce glass is recommended. The use of glass of this last gauge in sash windows makes the use of very heavy weights and very strong cords necessary.



(a) Rebate of sash cleared of old putty. (b) Rebate filled with putty (shown black). (c) Pane of glass pressed into position. (d) Front putty added and back putty cleaned up on completion of the job

Clearing the Rebate.—The first step in replacing a broken pane is to remove the old putty thoroughly from the rebate. This operation is usually carried out with a hacking knife, struck on the back with a light hammer to break the putty away from the glass and wood with its tip. An old chisel, ground to an angle of 45°, is useful for removing the front putty.

If the putty is first softened by running a hot iron or soldering bit over it, the putty can be cut away very easily without damaging the sash; but care must be taken not to scorch the wood. Clear away all old putty, cleaning well into the angles as shown in the above illustration at *a*, as any left may prevent the new pane being bedded-in properly or may cause cracking.

New windows should have the rebates well primed with red lead paint before being puttied, and old ones will be all the better for a coat.

When the rebates are clear, measure for the new pane. This must be $\frac{1}{8}$ in. smaller in both directions than the opening, to give room for putty between glass and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wood all round the edges. A properly inserted pane touches wood nowhere.

A supply of putty should be obtained at the same time as the glass; also a few brads or zinc "glaziers' points," for holding the glass in place while the final putty is added.

Applying the Putty.—Having made sure that the new pane is of the correct size, fill in the rebate with small pieces of putty squeezed in with the fingers, and smooth it down, as shown in *b*. Then press the glass gently into the putty, taking care that it is properly centred, with putty all round it, especially at the bottom.

Work round and round till the glass has sunk evenly into the rebate everywhere and squeezed out putty at all points at the back; this is illustrated in *c* of the diagram. The glass is then prevented from being pushed outwards again by any elasticity in the putty by a couple of brads or points along each side, touching the glass, driven into the wood far enough to project through the front putty when it is applied. While driving, keep the hammer up against the glass.

Making a neat job of the front putty requires some practice, but skill is soon acquired. The putty is laid on by hand all round as evenly as possible, and then smoothed by drawing the putty knife slowly along, with one side pressing on the edge of the rebate, and its point touching the glass.

Do not allow the putty to force the knife out of contact; also hold the knife flat enough to prevent its rear corner roughing the putty. The front putty should not be visible from the inside of the window, so its inner edge should be kept well within the rebate.

The first attempts may not be very successful. In some cases the putty may have been torn away from wood or glass, and in others show hollows, missed by the knife. It must then be gone over again, after a little putty has been added here and there. The corners give most trouble. Finish them with strokes approaching from both directions.

Any excess putty on the glass separated by the knife's tip is brushed off, and that at the back cut off neatly by drawing the knife along the wood. Any hollows in the back putty should be carefully filled in.

Next day, paint the front putty over with a paint matching that on the frame. Besides concealing the putty, the paint prevents it cracking, and helps to seal the joint. It should extend to the glass everywhere, but not be carried far enough on to it to be unsightly from the back. Hence the brush must be used carefully.

Any putty left over should be pressed down into a jam-pot and covered with water, which is protected against evaporation by a piece of glass or wood laid on the top of the pot. Stored in this way, putty will keep soft indefinitely, though it hardens quickly if exposed to air. Hard putty need not, however, be thrown away, as it may be softened by heating and working up in the hands, after the addition of a few drops of linseed—not lubricating—oil.

Cutting Glass.—Glass is cut with either a diamond or a tiny, sharp-edged and very hard steel wheel. The diamond is undoubtedly the finer tool, especially for thick glass, but a glazier's diamond is rather expensive, whereas a first-class steel-wheel cutter can be bought for a few shillings and often includes a few spare wheels. In the hands of an expert the wheel gives excellent results, and most of the world's glass-cutting is done with wheels. A wheel cutter must be kept well lubricated to do itself full justice.

The beginner is advised to get his hand in by practising on waste pieces of glass before attempting serious cutting.

The glass to be cut must be supported by an absolutely flat surface as large as, or larger than, itself—a drawing-board or a table. For cutting straight lines the tool must be guided by a straight-edge thick enough to prevent the tool climbing on to it. The straight-edge must be half the width of the head of the tool away from the marks to allow cutting through the marks.

The tool is held with the handle passing between first and second fingers, which press on the front, while the thumb presses on the back. A diamond cuts best when the handle tilts backwards at a particular angle, which can be found only by experience. If the tool is then properly used it cuts with a silky sound and makes a hardly visible scratch. A rough scratch means that the angle is wrong or the pressure too great.

The cut should be made right across from close to the beginning edge. A wheel will need more pressure than a diamond, but avoid scoring the glass, and on no account go over the cut again if dissatisfied with its appearance.

So far only the surface of the glass has been affected. But the scratch is converted into a crack right through if the glass is bent away from it. Thin glass separates readily enough. Large pieces should be laid with the cut just beyond the edge of the support and broken by a push. Thick glass may prove stubborn, in which case the glass is tapped smartly on the back, at the centre of the cut, until cracking begins. The crack may then be extended in both directions by more rapping.

If much cutting has to be done, it will

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pay to rule the board in both directions with lines dividing its surface in ½-in. squares, the inch lines being marked more boldly than the others. The lines will be visible through the glass and do away with the need for marking the glass when measuring, besides assisting in getting the corners square.

GLUE AND GLUING. — Failures of glued joints are due to one or more of three main causes: (*a*) poor glue; (*b*) imperfect contact between the surfaces joined; (*c*) disturbing the joint while the glue is setting.

First-class joints can be made only with good glue, freshly prepared. The best glue is Scotch. Glue that will absorb two or more times its own weight of water is good glue. Whether it does so can easily by tested by weighing a given quantity of it before and after a long soaking.

When the glue has been swelled into a jelly, it is transferred to a glue-pot fitting into an outer pot containing water, and heated for an hour or so, any scum being removed as it forms. Glue of the proper consistency runs freely off the brush. A wire should be stretched between the handle-loops of the inner pot to wipe the brush on if overcharged.

It is a mistake to imagine that plenty of glue makes a strong joint. On the contrary, the less glue there is left between the parts when they have been pressed together, the better is the glue's grip. It must be realized that glue has little strength in itself, though it can make two pieces adhere to each other so firmly that if the joint is forcibly broken, the wood itself, and not the glue, is found to have given way.

To leave only a little glue in a joint is obviously impossible if the surfaces to be jointed touch each other only here and there. It follows that when boards are to be glued edge to edge, their edges should be made as true and square as the skill of the worker permits.

Straightness of joint can be tested by clamping one board in the vice, joint edge upwards, and standing the other on it, joint face downwards, and looking for daylight between them. The high spots must be worked down with the plane till the boards touch all along on both sides. If the upper one tilts towards one side, the plane and square must be used to correct this.

Rubbing a Joint.—The lower board is clamped in the vice with vertical slips projecting just above its edge on the bench side to guide the upper board. The latter is then held upside down against the other, so that both surfaces may be coated with glue simultaneously. The glue should have been well heated, to delay cooling as long as possible.

The upper board is now rubbed to and fro lengthwise on the fixed one, while pressure is applied on the top to squeeze the glue out of the joint. As soon as movement becomes difficult, the upper one is adjusted and released. Any squeezed-out glue is scraped off while soft, and the joint is left to set a couple of hours before the boards are moved.

Even in very simple gluing operations, such as fixing a block to a wide surface, rubbing should be done, if possible, as it distributes evenly what glue is left in the joint.

Pressed Joints.—An alternative to rubbing is great pressure, either by heavy weights or by forcing the parts together mechanically. Small parts can be clamped in a vice. Screw-clamps are useful in many cases.

For gluing boards, especially thin boards, edge to edge, two pairs of battens of equal length should be provided with bolts near each end, and be bored for pegs at intervals of a few inches. When the boards have been glued and brought together the battens are slipped over them, the bolts are made fairly tight, and pegs are pushed through the holes nearest the boards.

Wedges driven between the pegs on one side and the board next them force the boards into contact, while the battens keep them in the same plane.

General.—Since glue sets quickly, have all apparatus ready to hand before the glue is applied, and work quickly. Do not be in a hurry to release glued work. Do not try to do too much gluing at once. Work by stages. Let B be securely glued to A before adding C to B.

Before refixing glued parts that have separated, soften and remove all old glue. Glue loses strength if heated up again and again. For good work, do not add fresh glue to old; boil the pot clean and recharge it.

Glues, Special.—Ordinary glue can be made *insoluble* by adding a little bicarbonate of potash to it. The mixture cannot be remelted after setting. The addition of linseed oil also renders glue waterproof.

A good glue for *leather* is made by mixing together gelatine swollen in water, turpentine, glycerine and oil varnish in the proportions (by weight) of 10, 2, 1 and 1 respectively. The gelatine is melted and the other ingredients are stirred in. Use hot.

Liquid glues, sold in collapsible tubes, are very useful for joining small parts. They should be applied thinly and allowed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to become tacky before the parts are brought together.

GULLEYS, COVERING-IN HOUSE.—The gulleys outside a house into which sinks and rainwater pipes discharge are in most cases left uncovered, with the result that many of them get blocked by leaves, and a heavy rainstorm often causes serious flooding.

It is a simple matter to make a gulley-cover out of sheet zinc or thin boards. On one side a semi-circular-ended notch is cut to enable the cover to be pushed up against the wall round the pipe. A wooden cover is prevented from shifting by slats nailed to the under side, at the right distance from the front and side edges just to enter the gulley. A zinc cover has its edges turned over except on the wall side, if the gulley is above ground level; or as tongues cut in the sides and turned down, where the gulley is flush.

GUTTERS, HOUSE.—As a great part of the soot, dust, leaves and other rubbish which fall on a roof is washed by rain into the gutters, these will gradually fill up if not cleaned periodically. Leaves are perhaps the chief offenders, especially as regards low roofs near trees. They decay and form mud.

A partly-filled gutter may do its duty well enough during normal rainfalls, but during heavy showers may be unable to carry away the water as fast as it is caught.

This is most likely to happen if the silting is worst near the lowest part of the gutter. The overflow from a gutter may trickle down the walls and saturate them until the paper, distemper, etc., on the inside are ruined.

Creepers allowed to invade gutters are a frequent cause of trouble, as they siphon the water out of them on to the wall below. If they extend on to the roof, matters are made worse. So they should be kept well below gutter level.

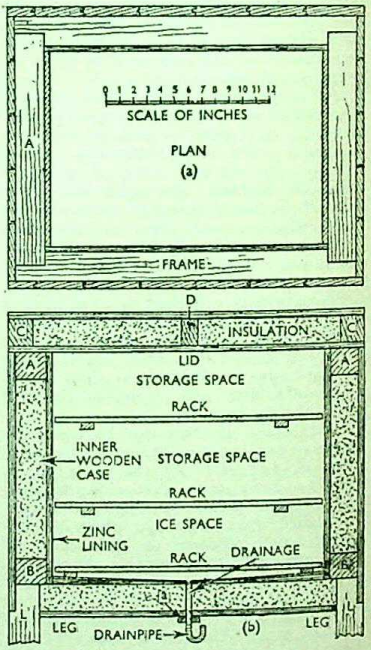
Gutters are sometimes cracked by house-painters' ladders. The cracks may not be visible from the ground, and be revealed only by close examination. If a wall previously dry becomes damp, scrutinize the gutters over it. In this connection it may be mentioned that down-pipes or leaders connecting gutters and drains sometimes cause trouble by becoming blocked, so that in heavy rain water spurts out of the joints on to the adjoining walls.

Another cause of trouble is the sagging of a gutter towards the middle, causing it to spill. The extent of the sag can be found by stretching a string tight along the lip. The string will serve as a guide for getting the gutter back to its correct slope.

Then there are leaky joints. These must be repaired as soon as possible. A length at one end of which a leak occurs must be removed—after provision has been made for supporting adjacent lengths in position, if this is necessary. The old stopping is then scraped away and replaced by putty worked up with red lead, or a thick paste of red lead and boiled linseed oil, enough being spread over the sockets for some to squeeze out all round when the bolts are tightened. Any surplus is then scraped off. The same procedure applies to the replacement of a broken length by a new one.

As a temporary measure to protect a wall from a leaky joint, nail to the wall under it a piece of zinc, the lower part of which is bent outwards, and given a shallow V-shape. Any water caught will then fall clear.

ICE CABINET, A CHEAP HOME-MADE.—Though we are not often visited by a spell of very hot weather, when one does arrive it is very useful to have some means of preserving perishable provisions



(a) Shows the plan of the frame and inner and outer casings of the ice cabinet. (b) is a vertical section through the ice cabinet, showing arrangement of various parts

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and preventing butter becoming almost liquid.

The chest illustrated by the two diagrams on the opposite page can be made cheaply by any handy person, and will be found quite efficient. It is shown in longitudinal section in *a* of the diagram. An inner casing, lined with zinc, has two frames, A and B (in section in *b*), attached to it; and to the outside of the frames are nailed boards forming an outer casing, which projects downwards 2 in. beyond the bottom of the inner box. The spaces between the two casings are filled with sawdust, slag wool, or other insulating material.

The lid is a framework, C, strengthened by a crossbar, D, boarded top and bottom. Its under side is covered by a sheet of zinc.

Since the ice used for cooling must melt by degrees, a drain pipe, turned up at the end to make a water-seal which will prevent the escape of cold air, is provided. The bottom slopes down slightly in all directions towards the top of this pipe, so as to be self-draining.

A sound Tate's sugar box does well enough for the inner case. Its internal measurements are roughly: length, 19 in.; width, 14 in.; depth, 17 in. The ledges on the inside at top and bottom of ends will have to be removed. But before removing them tack temporary strips on the outside, and clear of the areas which frames A and B will touch. Drive a few extra nails through the bottom to make it fit closely to sides and ends everywhere.

Next, construct frames A and B, which must fit the box closely, and be screwed on flush with the top and bottom with screws inserted from inside.

Nail in the bottom inside angles slips of ½-in. wood for the edges of the lining to rest on; and paste brown paper all over the outside of sides and ends, to prevent the insulating material working through joints.

The Zinc Lining.—Anyone lacking experience with a soldering iron had better leave the making of this to a professional tinsmith. If, however, he feels capable of the job, he should proceed as follows. The *bottom* is a closely fitting tray with edges turned up ½ in., but not quite squarely, so that when placed they shall press against the wood. Before putting it in position, make a ½-in. hole for the drain pipe and beat the edges of the hole downwards into a slightly conical form.

The *ends* have their bottom and vertical edges turned in ½ in., and rest on the bottom. The *sides*, or back and front, are turned over ½ in. at the bottom only, and overlap the vertical flanges of the ends by ¼ in. These vertical edges are drilled with a few small holes—remove any burr at the back—for brass tacks to hold them snugly up against the end flanges and make soldering easier.

Soldering.—All surfaces which will be soldered should have been well cleaned beforehand and "tinned" with the very fusible bismuth solder that must be used for the purpose. Do not have the bit very hot, for fear of melting the zinc; and while soldering press the parts together to make a good joint. Solder over all heads of tacks.

The Outer Casing is of ⅝-in. matchboarding, screwed to the frames. The insulation spaces are packed as the boards are added, thin slips being fitted at corners to prevent the material shifting when the chest is turned over. Pack sawdust close, rapping the wood to make it settle; but treat slag-wool more gently, to avoid crushing the fibres. The upper ends of the sides should project slightly beyond the top frame, leaving a little spare for planing off neatly when the boards have all been fixed.

The *legs* are of 2-in. by 2-in. batten, shouldered on two adjacent faces to be flush with the outside of the chest. The bottom, of ½-in. matchboards, has square notches at the corners for the legs. Before it is added, fit the drain pipe, soldered at the top to the lining. Then fit two strips of bottom, notched to fit the pipe, and pull the pipe until the lining touches the inner casing. It is secured in this position by soldering it to the collar, *a*. Placing the insulating material and finishing the bottom follow.

Cover the top edges of the chest with strips of zinc, lapping downwards over the lining, to which they are soldered. The joint between lid and chest need not be perfectly airtight, as a little ventilation is a good thing, and cold air does not rise.

The woodwork should be given two good coats of varnish outside, to keep out damp. The removable *racks*, shown in *b* of the diagram, rest on L-shaped strips of stout zinc soldered to the lining.

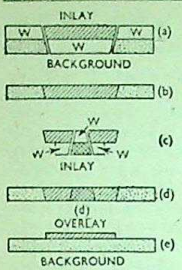
INLAYING AND OVERLAYING.—What is known as solid inlaying is the easiest form of inlaying for the amateur to attempt.

In this case the inlaid ornamental work goes right through the background. A treadle-driven saw is almost essential, as this has a table which can be tilted to any angle.

Wood ⅛ in., $\frac{3}{16}$ in., or ¼ in. thick may be used for the purpose. The stuff from which the inlay will be cut, and the background into which the inlay will be fitted, are nailed together and cut at the same time. Now, even the finest saw removes some wood, so if it were kept vertical the inlay would be a loose fit in the back

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



(a) Inlay and background (stippled) being cut on bevel (in section). (b) Inlay sunk into background. (c) Small inlay being cut for larger inlay. (d) Two inlays assembled. (e) Overlaying. W = waste

ground. The difficulty is got over by tilting the table to the left and feeding the work up to the saw while turning it clockwise.

In *a* the cut is shown much exaggerated in width. If the tilt be correct, the bevel will cause the inlay to fit the opening in the background exactly when it is put in place (diagram *b*). If the work were turned anti-clockwise and the cutting done on the left instead of the right margin of the inlay, the latter would taper in the wrong direction and be too small for the opening.

It would, however, be correct to cut in the anti-clockwise direction if one wished to insert a small inlay of different colour into the main inlay from the back, as shown in (*c*); or alternatively, to tilt the table to the *right*, and work clockwise. The worker has to consider tilt and direction carefully to avoid making mistakes. He must also bear in mind that for a given thickness of saw, the tilt should be less for thick than for thin stuff; and that, again, the thicker the saw, the greater the tilt must be.

An inlay is held in place by glue smeared on the edges before it is put in place.

The finest saws should be used for ordinary work, and the starting holes be made with a very fine drill *on* the lines of the design, since there is here no waste at any one point in place in both thicknesses. For the same reason the saw must never leave the line when turning.

In what is called "relief" inlaying, the inlay is rather thicker than the background, so that it projects a little beyond one face when fitted together. The effect given is that of inlaying on one side and of overlaying on the other.

Overlaying.—This term implies laying a part that has been fretted with the saw over a solid background, to which it is firmly attached. Overlaying thus gives ornamentation in relief. The background by its rigidity protects the fret, however delicate, from damage, while throwing it up by contrast in colour.

Overlays are cut of wood veneers $\frac{1}{16}$ in. thick; xylonite; aluminium, brass, copper or other metals; tortoiseshell or mother-of-pearl. By using the various materials very handsome effects can be obtained.

Wood veneer is too fragile to be cut as a single thickness, so either two or more overlays are cut simultaneously out of as many thicknesses fixed together—the design or designs being on the top one—or the veneer is supported by a piece of waste wood. If a sheet of paper is pasted to the back of a veneer before cutting, any part that may break away will be held in place for attachment to the background.

Metals are sandwiched between two thin boards for cutting with No. 1 saw. Hand-cutting is better than treadle-cutting in this case, as the saw must be used slowly. A thickness of about $\frac{1}{32}$ in. is recommended. Where aluminium is used it should have been prepared for the purpose, with one "satin" surface. Brass and copper will need polishing and lacquering, and whatever the metal be, its edges will require the removal of any burr left by the saw. Metal overlays are attached to the background by liquid glue, and by round-headed screws or pins of suitable colour.

Xylonite, imitating ivory, tortoiseshell, mother-of-pearl, etc., should not be thinner than $\frac{1}{32}$ in., and have one side unpolished, to enable the glue used for fixing it to get a good hold. This material cuts easily. It should be supported by a board of waste wood while being fretted, or be sandwiched between two boards.

KETTLE-HANDLE, INSULATING.—The handle of a kettle can be quickly encased in thick string which will prevent it burning the hand when grasped. The string should be quite $\frac{1}{4}$ in. thick. Lay the string along the handle to a point rather farther than the binding is to go, and bend it back to the point at which wrapping is to begin. Wind tightly over the two plies until the end of the loop is almost reached.

The string is now passed through the loop and drawn in under the wrapping by means of the projecting part at the other end. Trim off the superfluous string neatly, and the wrapping is complete.

KEYS.—If there be several duplicate keys to a front-door lock it is advisable to number them in some way, as by filing nicks in the shank or bow, and to note the number of the key assigned to any user. The unpleasantness of being locked out of the house through having forgotten to take out the latch-key, or having lost it, will not occur if a duplicate for emergencies is secreted in some easily accessible place outside the house.

Barrel keys—those with hollow shanks—give trouble if pocket fluff or other dirt accumulates in the barrel. The key will first work stiffly and finally refuse to turn,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as it cannot be pushed in far enough. The obstructive matter may have packed so hard that its removal will need the use of a bradawl, twist-drill, or red-hot wire.

Where a number of outhouses have to be locked up every night and the keys brought indoors, the keys should be hung on a board provided with just as many hooks as there are keys. A glance at the board will then show if any, or how many, keys are "out."

Painting the shanks of big keys yellow or red makes it easier to find a key if it be dropped, while a colour scheme assists in identifying keys.

When valises, hatboxes, etc., are stored away, their keys should not be left in the locks, lest they should be lost or damaged, but be tied to the handles.

Duplicate keys not in ordinary use—especially those of important locks—should be labelled to indicate to what locks or articles they belong, and be kept in a *safe* place. If left lying about, or where they can easily be got at, they become a danger.

Bunches of important keys which are carried on the person should be insured with a key-insuring company. The company supplies a metal tab for attaching to the bunch. The tab bears the address of the company and offers a reward to anyone who finds the bunch and forwards it to the company. A number on the tab ensures the bunch being returned to its owner, whose identity is known only to the company. *See also* LOCKS.

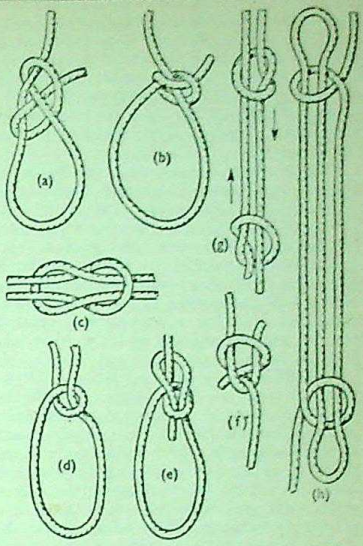
KNOTS AND HITCHES.—The proper way of tying the very useful *slip knot* is shown in *a* of the diagram. The end is passed under and round the main part; under itself and the main part, and tucked under itself again. A knot made in this way will stand a heavy strain, whereas one formed as in diagram *b* is not to be relied upon.

The *reef knot* (diagram *c*) is that most commonly used for joining two ends together. It holds firmly, but can be undone easily. Each end has a loop passing round both parts of the other end.

In the *full reef knot* the ends are formed into loops before the knot is tied and gripped in the knot with the ends sticking out. This knot is used for tying shoelaces, as it can be undone in a moment by pulling on the ends.

To be able to tie a *standing bowline* sometimes proves a very handy accomplishment. The loop will not slip, as the tie is self-jamming, but it can be undone quickly. A standing bowline is useful for lowering a person, or for throwing over a post to which, say, a boat is moored.

In *d* the first stage of forming it is shown, in which a loop is formed on the



Knots and hitches. Square end indicates the end of a piece, broken end the standing part of the rope. To save space, the square ends are shown shorter than they actually would be when making the knots illustrated

front and the end passed through it from behind. To complete, as shown in *e*, the end is carried round behind the standing part and tucked through the loop. When the bowline is drawn tight the end is firmly jammed, and the greater the strain on the loop the more tightly is it held. By passing the loop round the standing part before forming the bowline, a *running bowline*, which tightens on anything it encircles, is produced.

The *common bend* (diagram *f*) is a very simple but effective knot for uniting two ropes. A loop is formed in one end, and the other end is passed through and round the loop and passed between the loop and itself.

The *fisherman's knot* (*g*) for joining two parts consists of an overhand knot in each being tied round the other part. When the two knots are drawn together, as indicated by the arrows, they tighten each other, and give a much securer fastening than might be expected.

This knot gets its name from the fact that it is commonly used by anglers for joining two lengths of gut together. It is very easily undone if the two knots are drawn apart.

The *sheepshank* (shown in *h*) forms a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

convenient means of shortening a rope. The rope is zigzagged to and fro the number of times required, and the ends of the turns jammed in loops formed in the rope itself.

To prevent the loops slipping off if the strain is taken off the rope, the ends of the turns may be lashed to the standing part of the rope.

The *timber hitch* is used for balks of timber, logs and other heavy objects. It is made by passing the end round the object to be lifted and the standing part of the rope, and then giving it several turns back round itself. When the hitch is pulled tight, the turns jam against the object and are unable to slip. Making it is a matter of but a few seconds, and it can be released equally quickly when the rope is slack.

LADDERS. — Ladders which will be much exposed to the weather should be kept well painted, especially at the ends of the rungs, which are their most vulnerable points. If a ladder is so long that it cannot be housed under cover, it should be hung on spikes driven into a wall, and protected from rain by a roof of matchboarding. Provision should be made for securing it with a chain and padlock, or in some other way, so that burglars may not find it useful.

A ladder light enough to be raised by a single person should have the foot placed against the wall or other firm object, so that the ladder, when partly tilted, may not tip up. When erect it can easily be carried into the desired position.

A heavy ladder will require the assistance of a second person, who should place one foot on the bottom rung, grasp the second rung above this, and throw his weight backwards. His companion raises the other end above his head and works along under it, keeping it at arm's length. As it rises, the weight of his helper has increasing effect. Should the ladder be exceptionally heavy, a rope passed down from an upper window, tied to the top rung, and hauled on, will make things much easier.

A ladder is lowered by reversing the method of raising.

When a ladder tall enough to touch a gutter is put into position, care must be taken to bring it into contact gently, to avoid cracking or displacing the gutter.

The safest angle of slope for a ladder is one of 75° to the horizontal. If the foot of the ladder is away from the wall, etc., a distance equal to one-quarter its length —or, if the top reaches beyond the point of support, to one-quarter of the distance between the ground and that point—the angle will be approximately correct.

It is *dangerous* to set a ladder on ground which slopes away from it, or on uneven ground which leaves one side in the air, or on soft ground into which the sides may sink unequally. If there is any risk of movement, the ladder should be roped. A ladder resting against a smooth gutter is more likely to shift sideways than one with its end against a brick wall.

In carrying a heavy ladder the person at the smaller end of it should be nearer the middle than his companion to get his fair share of the load.

For gathering apples, pears and other fruit there is nothing to beat the cherry-picker's ladder, with a very widely-splayed base which makes it very stable laterally. A first-class ladder of this type is very light for its height, and yet strong.

Extension ladders, in two sections, such as window-cleaners use, are very handy for use about a house, as they can be easily housed—in a garage, for instance—and are quickly raised and lengthened. Either section can be used separately for jobs requiring only a small reach. It is worth while paying a little extra to ensure the ladder being light relative to its length, which means the use of the best quality of timber.

LAWN HARROW, AN EASILY-MADE.—The following contrivance will be found useful for harrowing lawns to rid them of moss and weeds.

Procure eight 3-ft. lengths of 2-in. by 2-in. wood. Nail four together, two on top of the other two, to form a 3-ft. square frame. The other four pieces are then equally spaced between the two on what will be the underside of the harrow. Four-inch wire nails are then driven 3 in. apart through the six bars, to project 2 in. and act as teeth. A diagonal bar added across the top, running from corner to corner, prevents the harrow from changing its shape.

The harrow is dragged by a rope attached to one corner.

LAWN MOWERS.—The greatest enemies of these machines are small stones kicked on to the grass from neighbouring paths or beds. A stone caught between the knife cylinder and sole-plate may do serious damage. So before a lawn is cut it is advisable to examine or sweep its edges.

To do its work properly a mower must be kept well lubricated and well adjusted. The parts that need oiling at least once every time the machine is used are the bearings in which the knife-cylinder revolves, and the chain, if the cylinder is chain-driven. The upper half of each bearing has a hole in it for the introduction of oil. Since these two holes quickly become blocked if left open, they

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

should be provided with removable wooden plugs.

Gear wheels should be kept well greased and the oil-can be applied occasionally to the roller or side-wheel bearings, ratchets and other places at which there is friction. The life of a machine will be much prolonged if the oil-can is used liberally.

To cut easily and cleanly, the cylinder-knives must touch the sole-plate lightly all along. Each cylinder bearing is provided with an adjusting screw above and below it, or a screw above and a powerful spring below. With the twin-screw arrangement, the bottom one of a pair must be slacked back as the top screw is turned forward, and vice versa. Adjustment must be carried out in very small stages at both ends alternately, until a blade of grass introduced at any point is cut through cleanly.

It is impossible to get good adjustment if the bearings are worn, for if the bearings are so set as to prevent separation of cylinder and sole-plate by the grass, the whole weight of the cylinder will be on the sole-plate when no grass intervenes; and, on the other hand, if the adjustment prevents the knives rubbing hard, the grass will push them away from the sole-plate.

Slack in the vertical—and more important—direction can be eliminated by removing the upper brasses of the bearings and rubbing them on fine emery cloth supported by a hard and perfectly flat surface until enough metal has been removed for the brasses just not to pinch the spindle when screwed up. Repeated tests should prevent the process being carried too far. If, however, pinching should occur, a thickness or two of paper must be inserted between the two halves of a bearing.

When knives and sole-plate become blunt, the machine should be sent to the makers or to a local ironmonger who undertakes resharpening. This operation can be done properly only with a special grinding equipment, and to attempt it at home is only a waste of time.

Using a Lawn Mower.—See that the wooden roller is parallel to the sole-plate. The standards by which it is raised or lowered have notches in their edges to help adjustment.

Wherever possible, vary the direction of cutting. If mowing is done, say, north and south one week, do it east and west the next.

When grass has grown unduly long, set the knives high for the first cut, and go over the grass a second time with them set low.

If the knives become clogged, back the machine a foot or two and depress the handle while the mower is pushed smartly forward to free them.

In damp weather free the rollers of any mud before putting the machine away.

LAYING AND CLEANING LINOLEUM.—Linoleum is a mixture of oxidized linseed oil, resins, cork dust and other substances rolled out on a backing of canvas. It is either monochrome (self-coloured) or patterned. A pattern may be either printed on the surface of a monochrome sheet or go right through to the backing.

"Through" patterned or inlaid linoleum is more expensive than surface-printed, since it has to be built up of innumerable separate pieces cut from sheets of different colours and assembled in place on the canvas backing by an extraordinarily ingenious machine. Heating and the pressure of rollers weld the pieces together into a continuous whole.

Whether the pattern goes through or not can easily be determined by examining a freshly cut edge. If it changes its colour with the surface design the pattern is inlaid and not superficial only.

Though many printed patterns resist wear very well, they will sooner or later disappear at places where the wear is heaviest. For example, a printed linoleum in a bathroom may be in excellent condition except just in front of the fixed basin. A "through" linoleum cannot lose its pattern except in the very unlikely event of being worn right through to the canvas.

The very thick form of linoleum known as cork carpet is delightfully springy to the feet, and a fine reducer of noise, but is much more expensive than ordinary linoleum. It is particularly suitable for passages, nurseries and playrooms.

Whatever quality of covering be selected, patterns should be unobtrusive, and the ground colouring should blend with the surroundings.

Laying.—Even a thick linoleum will, owing to its plastic nature, soon reproduce any irregularities in the flooring on which it is laid. Too much care, therefore, cannot be taken in making the boarding as nearly as possible a perfectly plane surface.

The heads of any tacks found should be broken off or driven in flush; projecting knots be planed down; and cracks more than ¼ in. wide between boards be filled with wooden slips, driven in tight and planed flush. The area to be covered should then be spread with thick felt paper sold for the purpose by linoleum dealers, cut to fit neatly at joints, which must not overlap and should not coincide with joints in the linoleum itself.

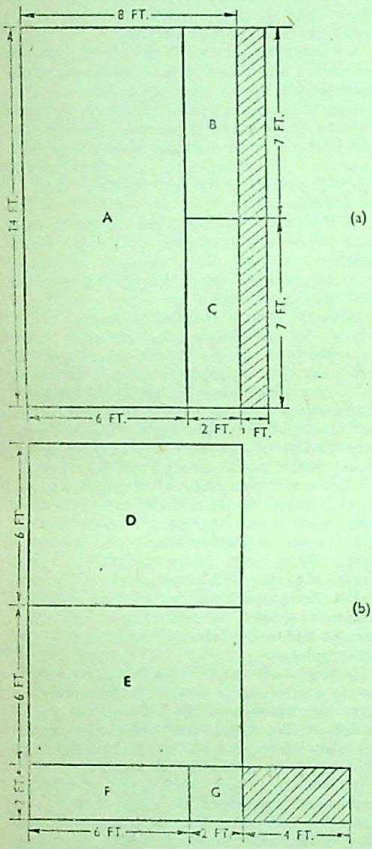
A word of caution. Linoleum is airproof as well as waterproof, and shuts air and moisture in as well as keeping them out. To

 CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lay it on a floor which is not well ventilated below—as is the case sometimes on ground floors—is to invite dry-rot by cutting off what ventilation there was through the cracks between the boards.

If, however, a floor has never shown signs of permanent dampness, and an examination of the outside walls reveals the existence of ventilators, there need be no fear of trouble; but in any case linoleum should not be laid on a floor that has been recently washed, until the boards have dried thoroughly.



Laying linoleum, showing two ways of covering a 14-ft. by 8-ft. area with linoleum 6-ft. wide. (a) 21-ft. run is used, B and C being cut out of a 7-ft. length divided down the centre. (b) 20-ft. run is required. D and E are full width. F is the same. G is part of another 2-ft. length. The waste in each case is indicated by the lined shaded portion in the diagram

Unpatterned linoleums are easier to lay than patterned, since no matching is required; and as a rule they cause less waste of material. The usual width is 6 ft., as being more convenient to deal with than greater widths, unless these happen to fit one dimension of the surface and so save joining.

The scheming out of a laying plan which will entail a minimum of waste and trouble requires careful thought, even if there be no pattern.

To take a simple example: An area measuring 14 ft. by 8 ft. is to be covered. If the linoleum is 6 ft. wide, it may be laid as shown in *a* with 21-ft. run, and 14 sq. ft. of waste; or as in *b*, with 20-ft. run and 8 sq. ft. waste. In the first case there will be 16 ft. of joints; in the second 14 ft. By using linoleum 9 ft. wide this waste is kept at 14 sq. ft., and all joints are avoided.

The diagrams assume the linoleum to be unpatterned. If there is a pattern, it might be impossible to make it fit without considerably more waste and joining, and a single piece of wide linoleum is clearly indicated here.

The inexperienced layer should note that new linoleum spreads appreciably after being laid, and that this fact must be allowed for. If a passage is, say, 4 ft. wide, the linoleum should have a width ¼ in. less, to allow ⅛ in. at each edge for expansion. Where two or more pieces are laid side by side, as in diagrams *a* and *b*, the position becomes more complicated as tacking along the joints prevents expansion in one or both directions.

It is therefore highly advisable to leave edges free wherever possible, and where tacks are needed, to use as few as possible in the first instance, so that readjusting the linoleum—if it shows signs of bulging in use—may be an easy matter. Bulges should be dealt with at once, lest they become permanent and even cause cracking of the linoleum.

Tinned tacks should never be used to fix linoleum; they hold it down only too efficiently. The headless, wedge-shaped brads that professionals employ do their work well—since linoleum tends to lie flat naturally and only requires to be prevented from shifting—yet allow the linoleum to be fitted easily.

Where patterns have to be matched at joins, one piece should be marked with a straight-edge, cut off cleanly and put in position. The piece to match with it is pushed under the edge and adjusted until

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the pattern is continuous, marked off, and cut along the mark.

Linoleum cracks very easily if bent towards the canvas side, so care should be taken when laying not to allow corners to turn under and be stepped on.

Where linoleum has to be fitted neatly round mouldings or awkward corners, it should be marked off from templates cut out of thin card or stout paper. Begin at the more troublesome edge and lay away from it.

Cleaning Linoleum.—Linoleum will last much longer if kept free from grit by sweeping. It should seldom be washed, and when washing does become necessary this should be done with a flannel and warm water, each part being rubbed dry before another is wetted. Then comes polishing with furniture or wax polish, used sparingly.

Where loose rugs are spread on linoleum and a high polish might make them slide easily when stepped on, it is safer to polish with paraffin oil or a special non-slippery polish.

LEAKS, HOW TO STOP.—A hole in a saucepan or kettle may be plugged by means of one set of washers and screw—"pot menders"—sold by ironmongers for the purpose. As a rule a utensil of thin tinned iron is not worth patching, and examination will show that it has developed many weak places by the time a rust puncture appears.

Galvanized buckets and small baths, the bottoms of which have been worn out, may be made serviceable again by running in half an inch of cement mixed with water to the consistency of cream. The cement will add appreciably to the weight, but the article will be useful in the garden and for rough purposes generally.

The bottom of a leaking iron *cistern* may be cured by the method described above, but it is important that the nodules of rust should be carefully removed first, and the metal cleaned as thoroughly as possible with a wire scratch-brush.

Holes in the sides may be stopped with bolts and washers spread with red lead paint.

Leaks in *gas pipes* may be stopped temporarily with soap, and permanently with paint, varnish or any other fluid substance which dries out hard.

A leak in a *water pipe* which has been burst by frost may be stopped, for the time at least, by bringing the edges of the crack together and laying along the crack a strip of fine canvas thickly spread with white lead paint and binding this over tightly with a long strip applied like a bandage, which in turn is painted over. The pipe must be dry when treated, and no water admitted until the paint has hardened.

If the pressure that the pipe has to carry is considerable, the damaged part should be repaired by a plumber (if of lead) or replaced (if of iron).

Continued leakage into the pedestal of a water closet is due usually to the washer on the plug raised by a pull on the handle having worn out, and is stopped by fitting a new washer, which can be bought at the ironmonger's. Leaks of this kind should be attended to as soon as they are discovered. Even a small flow if it is allowed to persist for weeks or months means a great waste of water.

The re-washering of leaky water taps and the stoppage of leaks in roofs and gutters are dealt with in separate articles. *See* GUTTERS, LEAKS IN ROOFS, WATER TAP.

LEAKS IN ROOFS, STOPPING.—Even a small leak may cause considerable damage in the course of years. Leaks are commonly due either to slates or tiles having dropped out of place; or to the zinc or lead "flashings" round chimneys and other projections not being in good order; or, in the case of a flat roof covered with lead or zinc, to the metal having cracked or perished.

The replacement of a tile or slate is hardly a job for an amateur, and the same remark applies to the repair of flashings; but if a slate has come off near the eaves, where the flow of water is greater than it would be higher up, a temporary repair may be made by pushing a piece of zinc up under the two slates of the course above, its projecting part covering the area left unprotected by the missing slate. If painted to match the surrounding slates it will not be unsightly.

The zinc sheathing of a large "flat" on a roof which had developed weak spots and leaked in many places was cured in the following manner. It was examined carefully all over, and every puncture discovered was enlarged and marked. A mixture of putty and white lead was then forced down through every hole in turn against the felt underneath, and a flat pyramid of it formed over the hole, overlapping the zinc all round ¼ in. to ½ in. Each patch was painted with white lead paint and allowed to harden. Then the whole roof was given a couple of coats of the same paint.

At intervals of a few years the roof has been repainted and, as it has never let a drop of rain through since first taken in hand, the heavy cost of re-zincing has been postponed indefinitely.

Cracked lead can be dealt with in the same manner. Where possible the edges of a crack should be turned up a little to allow

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the putty mixture to be pushed through and then beaten down again. Painting along the cracks follows.

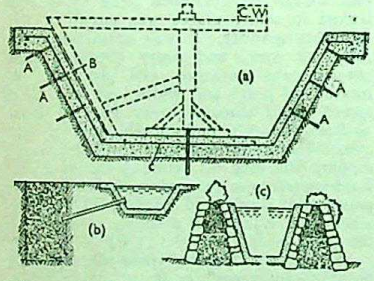
LILY PONDS.—A lily pond may be made by lining the bottom and sides of an excavation with well-puddled clay of suitable consistency. The sides will be more stable if faced with bricks set in cement-mortar, the wall having puddled clay rammed behind it as it rises.

A third alternative, which is perhaps the best where the pond is of small size, is to line the pond sides and bottom with concrete and cement-mortar which, if properly applied, is perfectly waterproof and will keep in good condition indefinitely. It is with this method of lining that this article is concerned.

In *a* is a sectional view of a circular pond about 6½ ft. across at the top and 2½ ft. deep. The circular shape has been adopted as being the simplest, since it lends itself to moulding with the aid of a rotating profile board, which is represented by broken lines in the illustration.

There is, of course, no reason why the dimensions given should be adhered to. A greater depth is desirable if expense is not to be considered, and a greater diameter would allow for a larger number of lilies, which should not be planted thicker than one to the square yard of surface area.

The lining is in two layers: an inner layer 4 in. thick of concrete, and a facing layer 2 in. thick of sand-cement mortar. The solid black line C is one of a number of diametral iron wires, $\frac{1}{16}$ in. thick, laid between the layers to reinforce the concrete and prevent the cracking and displacement which are only too likely to afflict large areas of plain concrete. The round dots B, on the sides, are sections of rings of similar wires encircling the pond, and attached, for convenience in fixing, to iron stakes A A, stuck into the ground before lining begins.



Lily ponds. (a) Sectional view of circular pond, showing reinforcement rods (thickness exaggerated) and profiling frame. (b) Arrangements for draining pond into soak-away pit. (c) General arrangements of a pond enclosed by a circular wall

The profiling mould is a light framework of boards rotating round a standard stayed in four directions perpendicular to a wide base, in the exact centre of which a ½-in. hole is bored to fit an upright centre peg in the centre of the pond. The framework is balanced by a counterweight, C W.

When the excavation has been dug to full depth, and the bottom rammed hard and carefully levelled, the centre peg is placed and the profile standard slipped over it and plumbed till perfectly upright. The frame is then put in place (at this stage its arms are 6 in. longer than shown) to swing the frame as guide; it is then easy to work the sides to a circular shape and a constant batter or slope at all points.

Into the sides stick a number of pieces of tile, slate, etc., projecting an inch or so, to make keys for the concrete; and place the bars A A in position. These must not project more than 5 in.

Concreting.—For the concrete layer a mixture of four volumes of ½-in. granite chippings, two volumes of clean sand and one volume of quick-setting Portland cement is used. Mixing must be very thorough, both when dry and while the water is added. Take care not to make the mixture sloppy, or placing it on the sides will be difficult.

The concrete is first applied to the sides, beginning at the bottom and working round and round in stages of a few inches to give what is already hard time to set partly, before more is added above it. The profiling board, adjusted to the final inside surface size, will assist here again, for if a distance of 2 in. be maintained between it and the concrete, the thickness of the layer will be correct. The top of the sides may be formed into a wide lip, as shown in the illustration, or be of the same width as the rest of the lining.

After the sides, the bottom. Since by this time the concrete first laid will have hardened, the bottom four inches of the sides must be well wetted and liberally coated with a cement-water cream just before the bottom cement is brought into contact with that of the sides. This will ensure a good joint. The same course should be followed at the beginning of each day's work and before the lining layer is applied to the concrete layer.

While the concrete is still soft, roughen it with the point of the trowel to form a key for the surfacing coat.

Surfacing and Draining.—Surfacing is done with a mixture of two parts fine sand to one part cement; but before the mortar is applied the reinforcement wires must all be placed and fixed. Any *loose* rust should

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be cleared off them, but a merely rusty surface is of no consequence.

In this case the bottom is done first. When it is sufficiently hard the profiling apparatus is set up, and the surfacing of the sides applied in stages as before, just clear of the profile.

Both concrete lining and surfacing should be protected from the sun and drying winds, and be kept damp while hardening. As soon as the surfacing is hard the pool should be filled to the brim with water, but the water should be replaced before lilies are planted, since it will have taken in some chemicals from the lining.

Diagram *b* on the opposite page shows an arrangement for draining a lily pond into a soak-away pit filled with stones and other loose material. The inlet of the pipe, which is closed by a plug, is a few inches above the bottom, so that earth may not be washed into it. During emptying operations it should be protected by a fine wire screen to keep out seeds, etc.

A Raised Pool.—This is an alternative one—and it can be made a very attractive one—to the sunk pool. Fig. 1*c* explains the method of construction used.

First a circular wall, faced on both sides with large stones and packed with small stones at the bottom and earth at the top, is built. Then the inside of the wall is lined and the bottom concreted.

The crevices of the outside wall may be planted with aubrietias, alyssum, saxatile, rock pinks, thymes, Alpine phloxes, lithospermum, sedums and other flowers, as the wall is raised; and the top forms a narrow bed for larger plants, some of which should be drooping varieties to trail down the wall. A pond of this kind is easily emptied through a hose into a drain by siphoning over the wall, if no outlet is provided at the bottom.

LOCKS AND LOCK REPAIRS.—The locks used in house doors fall into two main classes: mortise locks and rim locks. A mortise lock is housed in a mortise or hole cut in the door on its closing edge and is quite concealed on both sides when the door is shut. A rim lock is designed for fixing to one face of the door, to which it is held by three large screws on the face and two smaller screws through a tongue at right angles to the front of the lock and bedded in the edge of the door.

Mortise locks give greater security than rim locks as they cannot be got at until the door is opened, whereas a rim lock is accessible on one side, and removal of the box-staple into which the bolt shoots renders the lock useless. Moreover, the box-staple can be forced off with comparative ease from the other side of the door. Mortise

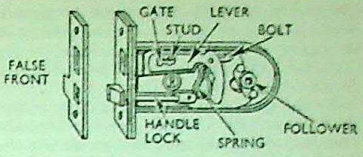


Fig. 1.—Mortise lock with cover removed

locks cannot be fitted to doors made of thin stuff.

The trouble which most often overtakes a lock is the breakage of the spring, or one of the springs, controlling the mechanism. Where only a single spring is used, the snapping of it will cause the handle latch to remain in the lock, though the locking mechanism may not be affected. Again, a lock with two or more levers may refuse to work if one of the spring levers breaks.

Removing a lock of either kind begins with taking off the knobs and the square spindle over the ends of which they pass. If grub screws are used in the knobs, one of these must be unscrewed. Where the knobs are attached to their roses, one rose must be unscrewed, after making marks to ensure the holes in it being respectively opposite to the same screw-holes in the wood when the knob is replaced.

A rim lock has simply to be unscrewed to be released. Most mortise locks have a false front, held to the lock itself by two short screws. The front must be taken off to get at the carpenter's screws holding the lock in place. When these have been drawn, the bolt is shot and used to pull the lock out of the mortise.

In a rim lock a removable plate forms the inner side. Two screws hold it in place. Some mortise locks have a casing split down the middle, one half being removable; while others have a removable side. When opening up the lock be careful to disarrange the mechanism as little as possible, and before taking any part out of place, note its position and in which direction it faces.

Locks are of so many designs that it is impossible to describe them in detail. The "works" of a simple form of mortise lock are shown in Fig. 1.

A single spring presses at one end against the tail of the lock lever and at the other against the tail of the latch. The "follower," when turned in either direction by the knob spindle, moves the latch backwards through the medium of a plate from which two studs project behind the arms of the follower. The ends of the last are stepped to fit holes in the lock sides which prevent it shifting. When the key is turned the lever is lifted, as the key's tip

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

enters a notch in the bolt, until the narrow part—called the "gate"—in the opening in the lever is level with a stud projecting from the bolt. The lock can then be moved forward by the key.

By the time it is full out the key allows the lever to fall, with the notch behind the gate embracing the stud and rendering the bolt immovable. Should the lever be raised too far or not far enough by a wrong key, the gate will not register with the stud, and the bolt will refuse to move. A lock with several levers has a narrow spring to each lever, fixed into the back end of the lever and turned over to press against the inside of the top of the lock.

In many locks the latch is reversible, so as to suit either left-hand or right-hand closing. So care must be taken to replace it, if removed, the same side up.

A broken spring is easily matched at the ironmonger's if the parts of it are available as a pattern, so keep a sharp lookout for them. An over-long spring can easily be shortened by nicking it across with a file and breaking off the surplus with pliers.

While the lock is open, see whether the follower has become worn at the ends of the barrel. If it has, replace it if possible. Also clean out dirt and oil the mechanism well. A lock lasts longer if lubricated periodically.

Do not necessarily condemn a lock because it is old and out of order. A small expenditure may restore it to good condition. This remark applies especially to old locks of superior make, many of which are of excellent materials and workmanship.

Fitting a Door Lock.—When buying a mortise or rim lock make sure that it is of the correct "hand," that is, will shoot the bolt in the required direction when right way up. If of the wrong hand it will have to be turned upside down.

Rim Locks.—The flange is first sunk into the edge of the door. Then mark and bore for all holding screws and screw on the lock temporarily. The next step is to mark the wood for the knob spindle and keyhole with a sharp metal point pushed through the lock. Remove lock and bore from the lock side, taking great care to centre the bit

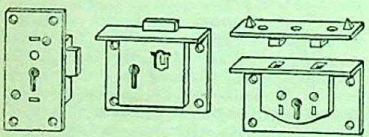


Fig. 2.—Types of lock. (a) Straight cupboard lock. (b) Till lock. (c) Box lock

correctly and keep it quite square to the door in all directions. As soon as the tip of the bit appears, finish the boring from the other side, to avoid splintering. Two or three small holes will be needed for the keyhole, the wood between them being removed with a padsaw or chisel.

The more correctly the keyhole is made, the better will it guide the key into the lock. In any case it must allow the key to enter easily. Replace lock, fix the handles and the rose and keyhole escutcheon (a small brass plate surrounding the keyhole) on the non-lock side.

Finish by screwing on the box staple at such a height that there is plenty of room above and below the bolt and catch.

Mortise Locks (Fig. 1, page 589).—Fitting these is a more difficult matter. Lay the lock right way up against one face of the door, with the knob spindle and keyhole in the horizontal centre line of the middle rail. Then mark the door's edge at points level with the top and bottom of the lock's casing. Square lines across from these marks and run lines down the edge with a gauge, as far apart as the thickness of the lock and equidistant from the corners.

To begin the mortise, two holes are sunk with a bit of the same diameter as the thickness of the lock. The holes must just touch the top and bottom marks, be perfectly parallel to the faces of the door, and as deep as the length of the lock. Parallelism may be checked by means of a straight-edge. The waste wood is removed with a mortise chisel used down the centre, followed by a wide chisel on the sides to clear the hole to the required width.

When the lock has been persuaded into place—tight places can be found by rubbing the lock with coloured chalk or paint—it should be noted whether the front is square with the edge. If not, more wood must be removed until things are right. The edge is then marked for countersinking for the front flange and false front of the lock, which must be let-in level.

The next step is to measure off very carefully on one face of the door the centres of the spindle and shank part of the keyhole. Bore through gently into the mortise; chisel away any splinters and replace the lock. If the holes register correctly, well and good; if not, they must be enlarged in the requisite directions with a circular rasp or hot iron.

The holes on the farther side of the mortise may be bored with the lock in position, and through the holes in the lock, with bits or drills of suitable size. Care should be taken that the door does not splinter when the drill is coming through.

After the lock is in place the socket plate has to be countersunk into the door jamb

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

at the right height, and the mortises for latch and bolt cut in the jamb.

Should the plate when screwed on not be in quite the correct position, ease the holes in it top or bottom, or along one side, as the case may need, with a file.

Other Locks.—The *straight cupboard lock* (Fig. 2*a*) is suitable for fitting right way up on either side of a cupboard door, as its bolt shoots in both directions. It is screwed to the back of the door.

A *till lock* (Fig. 2*b*) is that most commonly used for drawers. It is sunk into the back of the drawer front and shoots the bolt upwards into a mortise.

A *box lock* (Fig. 2*c*) has two internal hooks on the bolt which engage with staples projecting from a plate screwed to the box lid, and entering through holes in the lock's top. This type also is sunk flush into the woodwork.

The *Yale lock*, so popular for front doors, because very difficult to pick and equally easy to fit, consists of a round barrel containing the key mechanism which is let into the door from the front and attached to a latch, with hand knob and safety catch on the inside.

A *dead lock* is a door lock with key-operated bolt but no latch. The term *latch* is applied to any lock with self-closing latch like that of a door lock, drawn back by a key or handle, but without a separate locking bolt.

Door Knobs.—Knobs should be attached to the spindle, not to their roses, which are liable to pull off if much strain is put on the screws, and the last must be short in the case of mortise locks. The ordinary grub-screw attachment, that is, a short screw passing through the base of the knob into one or other of a number of holes in the spindle, usually does not allow of close adjustment, leaving an unsightly gap between rose and knob. In this case all pulling strain put on the handle falls on the grub-screw, which tends to wear loose.

Far better is the spindle threaded at one end for the knob to screw on to it. The sides of the spindle are fluted with grooves for the tip of a grub-screw, which is relieved from pulling strains, as these then fall on the spindle. The screw thread permits accurate adjustment.

A good form of rose has a projecting collar which surrounds the base of the knob and conceals the grub-screw, inserted through a hole in the collar when the handle is turned into a certain position. The collar prevents the screw being forced out. But the best form of knob has a screw passing through its centre into a threaded hole in the spindle end. The screw takes the pull and makes adjustment very simple, no grub-screw being needed.

LUBRICATION IN AND ABOUT THE HOUSE.—Wear of metal parts which move over one another is due mainly to their being lubricated insufficiently or with an unsuitable lubricant.

The function of lubricants is to keep surfaces from making contact. Thin oil, which is right for a sewing machine or typewriter, would be useless on the hinges of a heavy gate, as it would be squeezed from between the parts, whereas a grease quite unsuitable for delicate machinery would do the work properly.

Any part which squeaks when it is moved is undergoing wear and requires lubrication, whether a sash pulley, a bolt, a hinge or a barrow wheel. It is wonderful how greatly a few drops of oil will ease the working of a stubborn part and reduce muscular effort.

If latches of doors are kept well oiled, there will be no need to close the doors with a bang to make them catch. Many a lock wears out before its time because it is never opened up, cleaned and oiled. Garden gates are great offenders in the matter of squeaking. Hinges in damp places may rust up and be ruined if they are seldom used and never lubricated.

Special attention should be given to machinery with rapidly turning parts if these do not revolve in ball bearings. The lawn mower, for example, must be well oiled every time it is used. The bearings of mangles and wringers have to stand heavy pressure and, if neglected, will soon wear, besides making the labour of turning the machines much greater. *See* MANGLES.

Where machines are exposed to a good deal of dust and dirt, it is not sufficient merely to oil them. The oil may carry in dirt with it, and the dirt abrade the frictional parts. At intervals, the length of which will depend on the nature of the work and the surroundings, the parts should be separated, well cleaned with paraffin oil, dried, oiled and reassembled. This assumes that the operation can be done easily, without any need for expert knowledge.

In some cases a bearing can be successfully cleaned by squirting petrol through the lubrication hole. The spindle should be kept moving if possible while this is being attended to. When the petrol comes out clean it may be left to evaporate. Oil is then administered.

For general purposes fairly thick oils, such as are used for motor-car engines, are good. Clocks require a special thin oil, which should be administered in small quantities only with the sharpened tip of a match stick or fine metal point. Fittings permanently exposed to the weather should

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be lubricated with grease, or very thick oil, as rain would soon float out thin oil.

Sliding metal surfaces exposed to considerable dry heat are best lubricated with powdered graphite. Grease should not be used. Graphite is also a good lubricant for wood, but French chalk is preferable as regards cleanliness.

MANGLES.—A mangle should not be used as a wringer, since repeated damping may split the rollers sooner or later, and in any case will roughen their surfaces and so make them much less efficient for their proper work of producing a polish on practically dry articles. Mangling should be regarded as a substitute for ironing, or as a process preliminary to ironing.

Care should be taken not to pass buttons or metal fittings through a mangle. They may be broken themselves besides damaging the rollers.

If a mangle has springs at both ends, these should be screwed down equally. The rollers will be benefited by occasional rubbing—if at all rough—with fine sandpaper and polishing with beeswax dissolved in turpentine to make a thick paste.

This should be rubbed in with soft flannel while the rollers are revolved slowly. The wax, besides producing a much smoother surface, protects the wood against any damp in the articles mangled.

Should a roller develop cracks, they may be filled-in with plastic wood, which is scraped and sandpapered level when it has set hard. A wide and deep crack may be dealt with by boring screw-holes at right angles to it, with their upper ends large enough to allow the heads of the screws to enter below the surface.

When the screws are in place, but not tightened up, the crack is filled quickly with plastic wood, some of which will probably be squeezed out when the screws are tightened. The screw-holes are then filled in flush.

If a mangle gives violent jerks when turned, first examine the gear wheels at the handle end and then the star wheels at the other end. To get at the last, the protecting cover will have to be removed, after unscrewing the holding bolt. The trouble will most probably be due to a tooth or a wheel having broken off.

The only remedy is to send the broken wheel to the makers as a pattern and get a new one in its place. To loosen the key holding the wheel, the roller should be taken out and stood upright, with the other end of the spindle resting on a firm support, and the wheel be struck near the key, to drive it farther along the spindle till the key loosens. The key should be laid aside carefully for replacement as soon as the new wheel is received from the makers.

If any of the three wheels mounted on the roller spindles are found to be loose, the key should be driven in farther to tighten it. If, however, looseness is due to key or slot having worn, a new key will have to be fitted. This may be made out of the upper part of a 6-in. or 7-in. "cut" nail by anyone who is fairly skilful with a file.

Rollers which have worn hollow in the middle and uneven can be trued by turning down on a lathe. But only a small reduction of diameter is permissible, as the star wheels will give trouble if brought too close together.

The paint on the ironwork of a mangle should be renewed when it wears through, as the damp surroundings of a washhouse or laundry will otherwise cause rusting and consequent iron-mould of clothes, etc., that may touch rusty parts.

Vaseline is a good lubricant for gear wheels. The spindle bearings should be oiled regularly, and this will be the more easily done if a long-nosed oil-can is used. Once a year at least the mangle should be taken apart and all the bearings, wheels and spindles thoroughly cleansed of cubed grease and oil.

The compression screws should be slackened right back when the mangle is finished with for the day.

MEAT SAFE, A HOME-MADE.—A safe constructed in accordance with the following description will do good service for many years. The original—from which details are here taken—is still in use, and

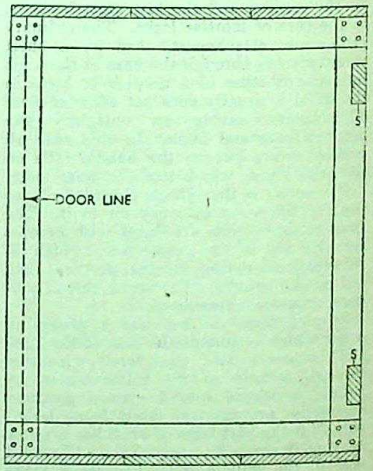


Fig. 1.—Side view of framework of meat safe. SS are the ends of the back struts

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

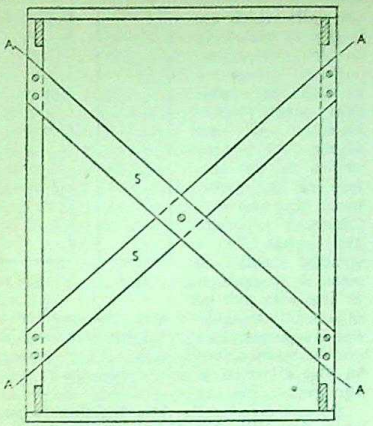


Fig. 2.—Back view after struts are fitted

apparently as good as new after completing its third decade.

The woodwork consists of three frames—one for the door, two for the sides—a solid top and bottom, and two crossing struts for the back. The material for the frames is slating battens which, when planed up, measure ¾ in. by 1¾ in; that for the top, ¾ in. thick. The top and bottom overlap the sides. The X-shaped double strut at the back gives lateral stability. Dimensions over all: height 2 ft. 6 in., depth 1 ft. 9 in., width 1 ft. 10 in.

Construction.—Cut pieces for the sides: four 29½ in. long and four 21½ in. long. All pieces of the same length are laid side by side and squared across at each end for the shoulders of halved joints. Allow a little spare at each end for squaring-off.

Saw just inside shoulder marks down to half-thickness point, marked with a gauge, and slit the ends down to the cuts, just not cutting out gauge marks. The four pieces of a frame are assembled, tacked with a wire nail driven through each joint, and fixed at the corners, after squaring, with carefully clinched nails (Fig. 1). The second frame is assembled on top of the first to ensure the two being of the same shape.

Tack the frames together and plane the edges into agreement on the outside edges, after cleaning off the spare at the ends of the pieces. Then cover them with pieces of perforated zinc overlapping the inside edges by ½ in. and held in place by narrow wooden strips of ¾-in. by ¼-in. wood, neatly mitred at the corners, nailed on top through the zinc. The zinc, which will prevent the sides altering their shape, is outside the frames, to make more room and not interfere with the fitting of shelves.

The top and bottom, of ¾-in. boards 22 in. long, are now nailed or screwed on.

Turn the framework back upwards and make guide marks (Fig. 2, A A A A) on the outside of the frame uprights 3 in. from each end. Lay a batten obliquely across the back up to two of these marks, and cut off with a little to spare. Tack one end to the framework, square framework and tack the other end. The frames can then be marked for the notches to be cut for sinking the bar in flush.

The second strut is laid across the other in the correct position and frames are marked for notches and both bars for the intersecting halved joint. When the notches and joints have been cut, the struts are put in place, flush with the back, and secured with screws. The back can then be covered with zinc.

The *door*, which has a flush strut running obliquely upwards from the hinge side, to increase rigidity, should be a bit large to begin with, to allow for planing down to a close fit. It shuts against ½-in. by ½-in. strips nailed to the sides, top and bottom behind it. When these have been fixed, the door is hung and zinced while in the closed position.

Crossbars are nailed to the sides to support one or two movable shelves of the open grid type, and a bar for hooks is fixed an inch below the top.

METAL LACQUERING.—This process consists of painting brightly polished metal over with shellac dissolved in alcohol, which when dry forms a hard, transparent skin protecting the metal beneath from the tarnishing effects of the atmosphere. The object of lacquering is to do away with the need for frequent polishing. Brass door-knobs and other articles which are handled frequently will need relacquering at intervals.

Lacquer for copper or brass is commonly tinted to a golden colour, but clear lacquers, which reveal the natural colour of the metal, are obtainable.

If the article to be lacquered has old lacquer on it, this must be removed by boiling in a solution of carbonate of soda, or brown potash, followed by clean water. It is then prepared for relacquering in the same manner as hitherto unlacquered metal.

After being thoroughly polished it is washed in clean water, dried in warm sawdust and brushed over with a soft brush. During these operations it must not be touched by the fingers, as this would be sure to leave grease on the polished surfaces.

Under one method of lacquering the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

object is not warmed until after the lacquer has been applied, and is then heated until the lacquer distributes itself evenly over the surface and hardens. Another method is to heat the object before brushing it over.

It should be mentioned that one class of lacquers, called cold lacquers, do not require the use of heat at all, but are merely brushed on like wood varnish. Some of them are quite satisfactory, but on the whole "hot" lacquers are to be preferred. The novice should try both methods of using them.

He will very likely find that applying cold and heating afterwards gives the better results, as the lacquer is then able to spread itself thoroughly before hardening. The object should be turned about repeatedly during the heating, to prevent the lacquer collecting on the lowest part of it.

Use a camel-hair brush for applying lacquer, and do the work by daylight. Be careful not to overheat the lacquer. A tin biscuit-box over a gas-ring makes a good heating oven.

NAILS AND NAILING.—The wire nail is the most popular form of nail for general use. It has a good holding power and is easier to drive than nails with blunt ends. It can be bought in sizes ranging from one to six inches in length and in various gauges or thicknesses. Its large head makes it difficult to punch in below the surface of the wood, and where the head is to be out of sight or beyond reach of the plane, the cut or stamped brad, with head projecting on one side only, is preferred—as for flooring or in joiner's work.

There is, however, a variety of the wire nail called the oval brad, which has a much smaller head than the ordinary kind and can easily be punched home. For small work, such as the construction of small boxes, use panel pins, which are thin wire nails with heads only slightly larger than the beads. Clout nails, with large, flat circular heads, are useful for fixing felt, etc., to roofs, where a large holding-surface is needed so that the tearing of the material is prevented.

Nails have much smaller holding-power when driven in the direction of the grain than they have when driven across it. Therefore, when nailing along the grain

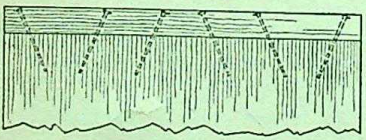


Fig. 1.—This shows dovetail nailing

use nails which are long proportionately to their thickness.

Nails driven in at different angles hold much better than if all are driven at right angles to the surface of the wood, since they have a "dovetail" effect, and what is a straight pull on some is a more or or less side pull on others. Dovetail nailing is especially useful for nails driven in the direction of the grain (Fig. 1).

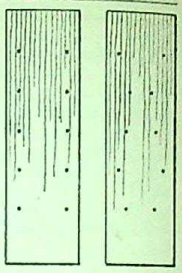


Fig. 2.—(a) Wrong way to drive in nails. (b) The correct way to drive in nails

Do not drive nails close together in the same line (Fig. 2*a*); this increases the risk of splitting the wood. Keep them in different lines as much as possible (Fig. 2*b*).

Especially in hard wood, make holes for nails near ends or edges with a bradawl or drill. This will prevent splitting. A bradawl should always have its point entered *across* the grain, so as to cut the fibres and not wedge them apart, and be twisted a little to right and left as it is forced into the wood. Twist drills are preferable for hard wood or large holes, as they remove material from the place where the nail will be, and never split the wood. The hole should, of course, be smaller than the nail, but if it is not too large it does not affect the holding-power.

Wedge-shaped nails should always be driven with their tapering faces in the direction of the grain, as otherwise they act as wedges and may cause splitting.

When nails are being driven into partitions or other parts which have a spring in them, a solid object, considerably heavier than the hammer, should be held up against the wood on the farther side to render the blow dead. If this backing-up is omitted, driving of nails will be found to be much more difficult and damage may be done.

Nails driven along the grain hold better if first dipped in a solution of sal-ammoniac, which quickly causes the nail to rust.

To clinch, that is, turn over the end of a nail so that it cannot be extracted, drive it right through and back-up the head with a heavy hammer while the end is bent over and forced into the wood with a lighter one.

For nailing sheet copper or lead use copper, not iron, nails. For zinc and galvanized iron use galvanized nails. Iron in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

contact with other metals corrodes quickly in the presence of moisture.

NEST BOXES FOR WILD BIRDS.—Many small birds, such as robins, sparrows, starlings and tits, take kindly to nesting places provided for them in convenient positions. A robin may even be attracted by a discarded kettle or teapot fixed up on its side.

Tits like a box with a hole in it near the top. The latter, or part of one side, may be made removable, so that the nest may be examined. When sitting has begun, the bird will not resent inspection, or at least will sit tight if it is done quietly and not too often.

The boxes should be placed where cats cannot get at them, and near enough to the ground to be examined with the help of a chair or stepladder. A perch on which the bird may alight before entering will be appreciated.

PAINTING WOODWORK.—To cover wood with layers of paint is an extremely simple business; but to carry out the work in such a way that the results shall be pleasing to the eye and durable requires care and understanding.

As regards inside woodwork generally, the painter aims at producing a surface free from roughness and smeariness. However many coats be applied to an imperfectly finished surface, the inequalities will show through. Knots left unstopped will ooze resin and stain the paint. Dust painted over, or dirt in the paint, produces myriads of tiny lumps. Finally, badly mixed paint and brushes of poor quality make it practically impossible to get a smooth finish.

Brushes.—A broad "duster," for brushing woodwork clean before painting, is an important item of the outfit. It should be kept dry, be reserved strictly for its proper purpose, and be cleaned with turpentine should it accidentally pick up paint.

A round brush called a "sash tool" is needed for painting narrow surfaces. When new it has a square end, but use will wear this down to more or less of a point.

Broad surfaces are painted with a flat "ground" brush, which may have a width of 1 in. or 1¼ in. The beginner at any rate should not select a wide brush for indoor work, though for the painting of outhouses, fences, etc., a wider brush may be required to get through the work quickly.

The bristles of new brushes are too long and springy for neat work. They should therefore be "bridled" or tied round with string for part of their length. The proper way of tying up is as follows: a piece of twine 4 ft. or more long is bent in a U loop a foot from one end, and the bend is laid up against the bottom of the bristles. The short end is then carried through the loop and the long end wound round and round the bristles and the short end, which is arranged in the direction of the bristles and, in the case of a flat brush, up one of the edges.

When the winding has proceeded far enough, the long end is bent back on itself to form a loop, carried round in the opposite direction to that used in winding, and passed through the loop, which is pulled up tight on the opposite side to the short end. Both ends are then bent downward, secured to the handle by tacks and cut off. As the bristles wear down, the binding is shortened by unwinding a turn or two and securing again.

A paint brush becomes more valuable as use wears it down to a good shape. At the end of a day's work a brush should be scraped on the paint pot to rid it of paint as far as possible and stood, or, better, suspended, in water covering the bristles, so that the paint left may not harden.

One that is to be stored away should be washed thoroughly in turpentine and then in hot soap and water, dried and wrapped in paper.

About Paints.—The ingredients of ordinary paints are white lead or zinc white, raw or boiled linseed oil or both, turpentine, driers, and, in the case of coloured paints, pigment.

The first is the base, or chief protective material; the oil enables the base to be distributed by the brush and, when it "dries," that is, hardens by oxidization, also helps to protect the work. Turpentine is used to thin the paint, but being volatile it does not remain in it permanently. Driers are added to hasten the hardening of the oil.

The larger the proportion of turpentine to oil, the "flatter" will the paint dry: and conversely a preponderance of oil tends to produce a glossy surface. Turpentine is commonly omitted from a first coat on new woodwork, called the priming coat, as the oil is quickly absorbed by the wood, and from the final coat for outside work exposed to the weather, as in this case thinning is done better with oil entirely, to obtain the maximum of protection.

The amateur may well be content to try paints ready mixed for at least the final coats, but he should avoid cheap paints. The extra cost of the products of the best firms justifies itself many times over.

It is easy enough to mix paints for under coatings, if the worker provides himself with supplies of oil, "turps," driers, white lead or zinc oxide paste and pigments ground up in oil. And this course has the advantage of enabling the paint to be mixed differently for the various coats

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which, as already hinted, should be somewhat differently constituted.

Mixing and Straining.—If, when a tin of paint is opened, there is a film of hardened oil on the surface, this should be cut away from the tin all round the edge with a knife and be carefully removed as a whole. The paint is then mixed thoroughly with a flat stick, worked into the angles of the tin until no signs of deposit remain.

It is advisable to strain all paint intended for indoor use, as it may contain small lumps and fragments of skin which, if left in, would disfigure the surface. A strainer is quickly made by cutting the bottom off a tin canister, beating the edge out a little all round and tying on to it a square of the canvas called "scrim," obtainable from most linen-drapers.

The strainer is stood on two sticks laid across the paint pot, and the requisite amount of paint poured into it. Scraping the canvas inside with a stick will assist the paint to run through. The canvas should be renewed every day.

Preparing New Woodwork.—The wood is first sandpapered and dusted. Then any knots are coated with "patent knotting" to prevent resin oozing out. The next step is to paint the wood with a priming coat—a mixture of white lead (or zinc white), oil, a very little, if any, turpentine, a little driers and enough red lead to produce a salmon-pink colour. The red lead makes the paint dry quickly and very hard; the oil, by entering the wood, prevents it absorbing oil from the next coating.

All holes, dents and cracks are now filled in with putty, smoothed down with a putty knife. When the putty is hard, the surface is sandpapered smooth, and everything is then ready for the colour coats.

Adding the Coats.—The first colour coat (for inside woodwork), which may be called coat A, will be composed of a pint of raw oil, half a pint of turps and two ounces of driers to every four pounds of white lead, and pigment. If the final coat is to be, say, green or brown, the paint may be darkened to a grey by the addition of black. It will then conceal the priming coat better.

Coat A is applied with strokes in all directions, finishing with strokes in the direction of the grain only. When dry, the surface is rubbed with fine sandpaper along the grain.

The second colour coat, B, must be mixed to suit the nature of the final coat, C. If C is to be "flat"—non-glossy—B should be weak in turps but rich in oil. Conversely, if a glossy or enamel C is intended, B should contain little oil but plenty of turps. Pigment as before, but of a somewhat different shade, as this will make it easy to see if any parts are missed by the brush. The paint is rubbed down.

A flat C coat should contain little oil, if any; a glossy coat, little turpentine. This coat is pigmented to the final colour desired and is not rubbed down. A little varnish added to C will make it dry very hard.

Painting Old Woodwork.—If the old paint is blistered, and generally in bad condition, the best course is to remove it and treat the woodwork as new. Burning off with a blowlamp is far the quickest method. The paint is removed with a stripping knife, pushed upwards whenever possible, as fast as the flame softens it sufficiently to come away easily. If the scraping is not done cleanly in the first instance, the re-heating of any patches left will scorch the wood round them.

Should a blowlamp not be available, liquid paint-removers may be used, the wood being washed afterwards and allowed to get thoroughly dry.

Should it be decided to paint over the old paint, this should be well washed with a weak solution of sugar-soap and rubbed down with pumice powder till all roughness has been removed. When it has dried, any blisters should be cut out and the patches exposed should be primed before being levelled up with putty. The new coats—possibly one may suffice, and more than two should not be needed—are mixed like the corresponding coats on new work.

Hints on Using the Brush.—The depth of paint in the pot should not exceed half an inch. Tilting the pot gives the worker a choice of depths. Excess paint should be wiped off on a wire stretched across the pot from lug to lug, not on the sides of the pot.

Do not overcharge the brush. Thick coats are more likely to blister than thin ones. Four thin coats are better than two thick coats.

Do not try to cover the surface too quickly. If the best results are desired, every stroke should be made carefully and the paint kept evenly spread everywhere. Keep stroking down in the direction of the grain, bringing the brush on to the work lightly at a very acute angle and removing it in the same way at the end of the stroke.

Special care must be taken not to let the brush stray on to another surface with the grain running in a different direction.

When painting a panelled door, begin on the beadings. Then do the panels; then the upright muntins between the panels; then the rails at top, bottom and centre, and finish at the upright stiles of the frame.

When *painting iron*, all loose rust must be carefully removed, as the paint would be sure to come away over any left. Red

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

oxide of iron paint or red lead paint should be applied as the first coat. Both of these get a good grip. Other coats should be applied as for woodwork.

PICTURES, HANGING.—The number and positions of pictures in a room are governed largely by furniture, such as bookshelves and cupboards standing against the walls. If there is room for but few pictures, those given a place should be really worth looking at, for pictures must not be regarded as mere ornaments or a glorified wallpaper.

A picture-rail or picture-rod makes hanging much easier and avoids damaging the walls with nails. Where such does not exist, one may be fitted easily and at a moderate cost by any builder, or by a handy amateur. The only alternative is to use nails driven in at a slight upward slope or, in the case of light pictures, hooks held by steel pins driven into the plaster.

Ordinary picture cord does well enough for suspending light pictures; but it is not to be trusted where a picture weighs more than 10 lb. Stranded copper wire should be used for pictures over this weight (excepting very heavy ones). Avoid brass wire, as it corrodes quickly. The wire sold for aerials does very well. Picture dealers sell copper wire, gilded over, for hanging purposes.

Very heavy pictures should be suspended by two vertical chains. Hooks in place of rings in the frame will enable height and level to be adjusted easily. If nails have to be used to carry such pictures, they should be driven into wall plugs, not merely into the wall.

The rings or hooks in a frame should be so placed as to give the picture only a slight forward tilt, with its bottom edge in contact with the wall. It is a great mistake to have a large tilt, which would be justified only if the picture were hung very high —as it should not be.

Height of hanging is to a certain extent a matter of taste. The general rule is that it should permit the easy examination of a picture. Where the pictures are of very different sizes, one has the choice between a uniform top level, a uniform bottom level, or a uniform centre line. The first may be most suitable for a low room; either the second or the third for a lofty room.

If some of the pictures to be hung in a room are much lighter in tone than others, select the positions which are best lighted for the darker pictures.

The worst possible position for a glazed picture is directly opposite a window, where the glass will act as a mirror and conceal what is behind it, if viewed from in front.

Pictures should not be placed where sunlight can fall upon them directly at any time of year.

At every spring-cleaning the cords of all pictures should be examined and tested at the suspension point, where they perish first, by gripping on either side and pulling hard. Even if it stands the test a cord which is much discoloured, or a wire that shows signs of corrosion, at this point, should be replaced.

PLANES AND PLANING.—The three wooden planes which the joiner uses for ordinary planing — jack, trying and smoothing planes—are described and illustrated in the article on TOOL OUTFITS. For amateur use there is much to be said in favour of the iron plane, as it includes a mechanical adjustment which makes the correct adjustment of the cutter an easy matter, and its sole or contact surface remains perfectly true, being exempt from wear and warping. The more delicate operations of cabinet-making in any case require the use of metal planes of suitable size.

Whatever type of plane be used, its blade will need frequent resharpening. If a keen edge is not maintained, a good surface cannot be produced. A blunt cutter roughens, and may even tear splinters from, the wood.

In all but the smallest metal planes the cutting blade has a "break" or "back" iron attached by a screw to its front. The function of this piece is to turn the shaving up into the throat of the plane as fast as the cutter separates it, and make it come away cleanly. The back iron is removed before the cutter is sharpened, and replaced afterwards with its bottom edge $\frac{1}{16}$ in. from the cutting edge for a jack, and $\frac{1}{32}$ in. to $\frac{1}{64}$ in. for a smoothing plane.

Sharpening and Adjusting.—Sharpening is done on a very fine-grained stone, first wiped quite clean and given a few drops of thin oil. The strokes should be short, until skill is attained, and care be taken not to alter the angle between cutter and stone and thereby produce a rounded instead of a flat bevel.

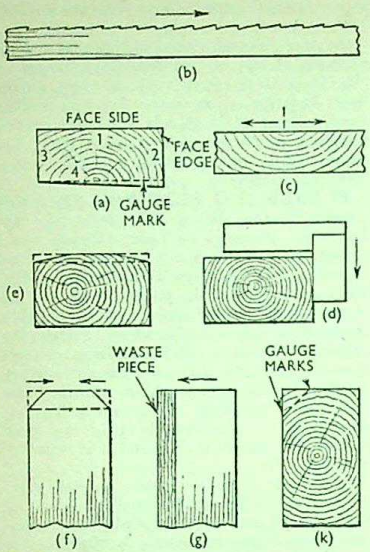
Adjusting the cutter in the plane to give the desired degree of cut should be a matter of test as well as of eye since, if the cut is set too coarse, the wood may be damaged before the correct adjustment is arrived at. It is therefore advisable to set fine at first and increase the cut if it proves insufficient.

In the case of wooden planes, the plane is stood on its back end with the top leaning towards the worker so that he may look down the sole, and cutter and wedge are pushed into place, the cutter just projecting. The wedge is given a tap with the hammer to secure the cutter.

If the cut is insufficient, the cutter is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



(a) Order in which surfaces of a board are planed. (b) An exaggerated view of the surface fibres left by the saw. Arrow indicates direction of planing needed. (c) Where grain rises to surface planing must follow the lie of the grain. (d) Applying a square. The stock is pressed against one face and slid down until the blade touches the other face. (e) When removing considerable amount of material bevel towards each edge and then remove hump. (f) Chamfer corners of waste before planing across grain, and plane towards centre from both corners; (g) or clamp a waste piece on the side towards which planing will be done. (k) Before chamfering, accurately gauge-mark the limits of the chamfer

knocked in farther by light blows on the end. If too coarse the plane is stood on end as before and the top of the front tapped. This will cause the iron to move inwards. *Hard* blows would loosen wedge and cutter, and they are needed only when the cutter is to be taken out for honing.

Holding and Using a Plane.—A wooden smoothing-plane is held by curving the left hand round the front end and straddling the right hand over the back behind the iron, or curving it round the back end. A jack has a toat or handle at the back for the right hand; the left hand grasps it with thumb pressing on the near side and the fingers curving over the top.

The pressure should be greater on the front of the plane when beginning a stroke, and be transferred to the back towards the end. Except with smoothing planes, used for truing up a surface locally, the strokes should be long and steady to remove a continuous shaving, which will show, by the constancy or variation of its thickness, whether the surface has approached truth or not.

When working over difficult places, such as round knots or across the grain, the plane may work better if held somewhat obliquely to the direction of motion, to give a "drawing" or slicing cut.

Hints on Procedure.—Before planing a board examine both sides and select the better as the "face" side; that is, the one which will be the basis for working from, and will be arranged to show if only one side is to be visible when the board is in position. The proper routine of working up a board is explained by *a* in the diagram. First the face side is made quite true. Then the face edge is planed quite straight and square to the face side. The marking gauge is then used to fix the width and the other edge is planed square down to this mark. Finally, the other face is planed. Should its unplaned thickness vary in different places the gauge will be used along the edges from the working face and planing be done down to the marks.

Before planing a board wipe it over with a handful of shavings to remove any grit which, if left, would blunt the cutter. Then examine the run of the surface fibres of the saw marks. These are shown in an exaggerated form in diagram *b*. The plane must be used in the direction of the fibres, as indicated by the arrow, until the surface is smooth.

In *c* a case where special care is needed is explained. The grain here rises to the surface in both directions, and to avoid splintering the wood the plane must be worked outwards from the centre of the patch to suit the different runs of the grain.

To Test for Twist.—If a board has a twist in it, planing the surface smooth will not necessarily produce a flat surface. To test for twist or "wind," as the joiner calls it, two strips of wood, with their edges perfectly straight and parallel, are stood on edge across the board. A sight taken over their tops will show at once whether the parts of the board on which they rest are in the same plane or not. Planing must be persevered with until the top edges of the strips are parallel, wherever the strips be placed. The surface will then be "out of winding" or perfectly flat laterally.

The face side finished, the face edge is taken in hand. Its squareness is tested with the square, applied as shown in *d*, and kept in contact with the edge while

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

moved downwards till the blade touches the face side; or the stock can be slid over the face side till the blade touches the edge.

The other edge is gauged off from the face edge and squared in like manner; and the second side can then be worked down. If planed to gauge marks on both edges, it should be slightly bevelled down to them both ways from the centre (diagram *e*) and the hump then removed.

Planing Across the Grain.—If a plane moving across the grain comes off over a square edge it will most likely splinter the corner. The end of a board should therefore be planed from both sides towards the middle, as in diagram *f*, unless the corners have been chamfered off down to the finishing line, in which case strokes right across can be made until the line is approached. An alternative is to protect the finishing edge by a piece of waste clamped tightly to it, as shown in diagram *g*. As already mentioned, oblique strokes are useful in cross-planing.

The precaution of running over the back of the grain is needed when bevelling the end of a board.

Before chamfering off an edge, mark the limits of the chamfer on both faces with the gauge *k*, and work down to them. Do not rely on the eye.

Rebating.—A rebating plane has a cutter as wide as the body, and a throat open at the sides to allow shavings to escape. Its purpose is to make rectangular cuts in the edges of pieces into which glass or panels have to be sunk.

Say that a rebate $\frac{1}{4}$ in. wide and $\frac{3}{8}$ in. deep is to be cut. The board is first gauge-marked for width and depth of rebate, and a perfectly straight strip is tacked or clamped $\frac{1}{4}$ in. away from the edge to guide the plane. The material is then planed away down to the depth mark. Care must be taken to keep the plane vertical and well up to the guiding strip all the time.

Ploughing and Routing.—The plough plane is for cutting grooves in or near edges. It has an adjustable fence on one side to fix the distance of the groove from the guiding face or edge, and a vertical screw to regulate the depth of the cut. With the plane is supplied a set of eight cutters, ranging from $\frac{1}{8}$ in. to $\frac{5}{8}$ in. in width. It can be used for making rebates, by ploughing two narrow grooves to the depth and width of the rebate at right angles to one another till they meet.

A router is in effect a flat plate from which an L-shaped cutter projects, the bottom of the L being bevelled to an edge. Its function is to remove the waste between two saw-cuts made across the grain and form a groove for a shelf, etc. The waste is planed away in stages by setting the cutter farther out after each journey until full depth is attained.

Here are a few hints regarding the care of planes:

Never lay aside a plane the right way up, for if the cutting edge struck metal it would be chipped. Lay it on its side.

Before putting a plane away, retract the cutter into the body.

Retain a smoothing-plane for finishing only; do not use it on a rough surface.

A little grease or oil on the sole of a plane will make it run more sweetly.

PLASTIC WOOD.—This is a kind of putty, made by mixing wood powder with certain chemicals. It clings very firmly to any clean wood surface to which it is applied and hardens very quickly on exposure to the air. When hard it can be planed, cut, carved, stained or varnished. It does not powder nor blister and, having no "grain," it does not split. In fact, it possesses so many useful qualities that many readers who do not already know of it will be glad to make its acquaintance.

The material is sold in tins and collapsible tubes. The latter are the more convenient for small work as the putty hardens very quickly, and by capping a tube immediately after what is needed has been squeezed out of it, the contents remaining are protected against hardening. In the case of tins, however careful one is to replace the cover, air must be enclosed.

Plastic wood which has partly set can, however, be softened again with the solution sold by the makers for the purpose. Some of this solution should be procured, as it is also useful for cleaning fingers and tools used in the application of the putty.

Plastic wood is excellent for filling up deep dents, holes and cracks in wood, and for mending corners which have been damaged.

If a considerable bulk is to be used in one place, it should be applied in thin layers, each being allowed to harden thoroughly before the next is laid on. The putty may be used for plugging holes in walls to hold screws.

Being highly inflammable in its soft state, owing to vapour given off, it should be kept away from a naked flame.

PLUGGING WALLS.—Heavy objects such as bookcases and cupboards which have to be hung on walls should be held to it by screws. These cannot of themselves get a grip on plaster or brick, and the only safe course is to insert them into wooden plugs driven into holes made for them.

A hole should pass through the plaster either into a joint of the brickwork or into solid brick. If partly in one and partly in the other, it will give trouble in the drilling, and the plug may not hold. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

position of a joint can be found by probing with a fine bradawl, which will be arrested by brick when it has penetrated half an inch or so. Plugs inserted in brick hold best.

If the wall is papered, the paper is cut on three sides round where the hole is to be and the flap is pinned back to expose the plaster. Drilling is done with a chisel sold for the purpose, or a tube-like jumper with serrated end. To guide the tool a circle, rather larger than the hole will be, should be scratched on the wall before the plaster is disturbed. The tool is given part of a turn between every two blows and while penetrating the plaster should be used gently, to avoid breaking the edges away. When brick is reached hard blows are needed.

Make the hole 2½ in. deep and clear it out well. A square, slightly tapering plug, preferably of oak or other hard wood, is cut, rather less than 2½ in. long. Its end corners and four side corners are chamfered off slightly. It should then be just too large to enter the hole. Hammer it in flush and drill a hole in the centre for the screw. Then replace the paper, after making a hole in it opposite the screw hole.

The positions for other plugs are now fixed by measurement or by using the thing to be hung as gauge, and the plugs inserted in the same way as the first; but screw-holes should not be made in them until the article has been anchored by the one screw and supported in the correct hanging position, when the holes in the hanging attachments used will be safe guides to follow.

A well-set, hard plug should never come out. A soft-wood one, which was a little on the small side to begin with, may loosen by shrinkage and compression; and this is an argument in favour of hard plugs, which, if large enough to be fairly difficult to drive, should never give trouble.

For fixing screws into bare brick, marble, stone or concrete, there is much to be said in favour of patent fibre tubes, which are not much larger in diameter than the screw itself and are expanded with great force against the material in which they are sunk by the wedging action of the screw. They require only small holes, less than ¼ in. in diameter for the smallest size, and these are quickly made with the special tool provided in an outfit.

PLUMB-RULE, MAKING A.—This simple piece of apparatus is useful for testing whether walls, posts and other parts of structures are vertical.

It can be quickly made out of a 6-ft. length of floorboard, planed smooth all over and given quite straight and parallel edges. A line is marked with the gauge down the centre from end to end and blackened with graphite or Indian ink so that it can be seen easily.

Eight inches from what is to be the bottom edge a pear-shaped hole for a plumb-bob is cut in the centre. At the top end three fairly wide saw-cuts are sunk into the end, to a depth of half an inch or so—one in the centre line and one on each side of this. These are for the plumb cord, which is passed through the centre cut and wound round through the others.

Just below the cuts, on the face, a transverse slip of hard smooth wood ⅛ in. thick is nailed, to hold the cord clear of the face when this is perfectly vertical; and just above the bob-hole is a loop of string or leather, or a wire stirrup, for the cord to pass through and restrain the movements of the bob.

The last should preferably be of brass, and have a fine point, the tip of which will be on the centre line when the plumb-rule is vertical laterally.

If a spirit level is let into one edge, the rule will serve also for levelling.

PLYWOOD.—This consists of three or more veneers of wood (usually birch) glued together with their grains running in different directions. It may be bought in thicknesses ranging from $\frac{1}{16}$ in. up to 1 in., according to the number of plies. Though not entirely exempt from warping, especially if thin, plywood warps less than ordinary wood, and owing to its construction does not tend to warp in any particular direction.

The crossing of the grains prevents splitting and makes it much stronger than ordinary wood of the same thickness. The glue used—its composition is generally a trade secret—is very resistant to damp, and it is notable that the wood may be soaked in water for many hours without separation of the plies.

Thin plywood is used widely for fret-work, since its toughness enables very delicate designs to be cut without fear of breakage. It comes in very handy also for the backing of pictures and the making of toys, dolls' houses, etc. Plywood ¾ in. or ½ in. thick is excellent for the tops of tables and for drawing boards. The material is specially useful in large sizes, as sheets measuring several feet both ways can be bought in any thickness, and the troublesome business of making glued joints is thus avoided.

Care has to be taken in planing up the edges of plywood. The plane blade must be very sharp, as it is always cutting some plies across the grain; and at the corners, in order to avoid pulling out splinters of some of the plies, planing should invariably be done from the corner inwards.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PROTECTING PIPES AGAINST FROST.—The time-honoured method of allowing taps to run at night during frost is not always effective, and besides being very wasteful may be disastrous if the outlet of a sink or bath becomes sealed by ice.

The safest method of protecting the main is to have a drain-cock fitted near the turn-off cock: turn off the water at night, and allow all the pipes connected with the main to empty themselves through the drain-cock and indoor taps. No water will then be left to freeze, and a supply of fresh water is assured.

Cisterns and Outside Pipes.—Draughty situations are specially favourable to freezing. The connexions to a service cistern in the roof are very vulnerable and should be well wrapped in felt and straw or be stuffed round with protecting materials where they cannot be wrapped. A cistern generally stands on rafters, and there are spaces under it where cold air can circulate. These should be blocked with straw. Wrapping the sides in old carpets and covering over the top with carpet and straw will assist greatly in keeping the water above freezing point. A further safeguard is to open the trapdoor into the roof and admit the warm air from the house into the roof.

Pipes running down inside walls facing north and east also demand special attention, especially where they pass near windows. A draught from a partly closed window may have disastrous effects on an unprotected pipe; and a note should be made to close the windows of lavatories with pipes and flushing cisterns near them, at night.

Inside Pipes.—Felt, asbestos and wooden casings are the best permanent protection for indoor pipes. Where such protection is not feasible, a small paraffin lamp, placed near the pipes, will keep all but the severest frost at bay.

Frost will sometimes invade inside fittings through the metal of the pipes themselves, which is an excellent conductor of cold. The trap of a bath or sink may become frozen by cold reaching it through the pipe which passes through the wall and discharges into a gulley outside. Therefore these outside pipes should be well wrapped before winter comes on and, if possible, be further protected by straw stuffed between the wall and canvas attached to it.

Pipes leading to taps which have ceased to be used—one finds such sometimes in pantries from which washing-up has been transferred to the scullery—are dangerous, and in many cases it would be advisable to have them removed.

Lead pipes which have been hammered to an oval section are not likely to burst, as ice will make room for itself by restoring them to circular form.

Lavatory and gulley taps can be saved from freezing by pouring brine into them at night, since the freezing point of brine is far below that of plain water. The brine should be introduced gently, so that it may not mix with the water which, being lighter, will be displaced by it.

Thawing Pipes.—Though a pipe may freeze up, bursting may be prevented if the pipe is thawed again immediately. Hot-water bottles prove very useful in places where hot water cannot be applied with a sponge or flannel.

Hot flat-irons, again, may be effective in corners difficult to reach with the hand, as they radiate a great deal of heat.

RAIN-WATER is fit for human consumption only after boiling or filtering through a filter fine enough to stop the tiny bacteria which may swarm in it. Even after treatment it may be unsafe if it has been stored in lead-lined tanks or passed through lead pipes, as it is able to dissolve lead. Rain-water should be stored in iron or concrete tanks and conducted through iron pipes.

Where a house has to depend mainly on a well for its water supply, stored rain-water will be a very useful addition in time of drought for washing and cleaning purposes, and for watering the garden.

A house with a roof area of 900 sq. ft. will have from 10,000 to 15,000 gallons of rain fall on it during a year—an average of 28 to 42 gallons per day. Underground storage is the best, and the most suitable material for the construction of tanks is reinforced concrete.

A tank to hold 5,000 gallons would be 10 ft. square inside and 8 ft. deep. Sides and bottom should be 8 in. thick and reinforced with circumferential steel rods $\frac{5}{8}$ in. thick running round the sides in the centre of the concrete, their spacing increasing from 6 in. at the bottom to 12 in. at the top. Crossing the rings should be $\frac{3}{4}$-in. vertical rods, spaced 30 in. apart. These last should extend across the bottom.

To allow for doming over the top, the hole will need to be 3 ft. or 4 ft. deeper than the vertical parts—unless it be decided to have the "neck" above ground level and bank it round with the excavated earth, which would save a good deal of labour.

Its horizontal dimensions will have to be 16 in. in excess of 10 ft. each way, to allow space for the 8-in. wall all round. This assumes that the ground is firm enough to render lining unnecessary.

The concrete should consist of four parts stone passed through a $\frac{3}{4}$-in. mesh screen, two parts sand and one part Portland cement, mixed rather wet and well pugged

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

against the outside of the wooden form used. The form is built up of vertical boards backed by horizontal rings of timber, well shored, and is supported 8 in. above the bottom of the excavation by detachable legs which must be withdrawn as soon as the concrete used for covering the bottom has set.

When the sides have been completed, the form is floored over at the top and well supported by struts reaching to the bottom. A hole 2 ft. square at the centre has a wooden trunk built round it, 3 ft. or 4 ft. long. Consolidated earth covered with sand is piled up to form a pyramid with its apex near the top of the trunk.

A 4-in. layer of concrete, with reinforcing rods buried in it, is spread over the sand from the top of the walls upward. When this has set for a fortnight, a flooring board is removed to let the earth and sand fall into the tank, from which it is removed in buckets through the opening. The form and flooring can then be dismantled and sent up.

During the cementing of the dome, openings must be left for the inlet and pumping pipes, and short ventilating pipes should be fixed at each corner, with bent-over ends facing in different directions and covered with gauze to exclude insects.

The tank will be more easily cleaned if its bottom has a small fan towards one side; and its watertightness will be assured if the concrete is washed over with neat cement, mixed with water to the consistency of cream.

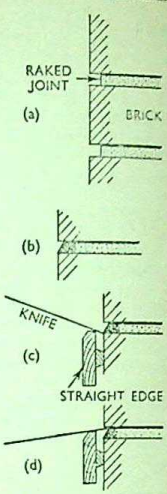
REPOINTING A GARDEN WALL.—Rain and frost cause lime mortar exposed to them to crumble, and the poorer the quality of the mortar the faster it deteriorates.

Many garden walls, the brickwork of which is often inferior to that of the houses to which they belong, show signs of decay at a comparatively early age. The mortar joints begin to gape, and once water has a good lodgement, frost does its work more quickly. A stage will presently be reached at which the wall becomes in effect a pile of loose bricks kept in position chiefly by their own weight.

Damage due to the mortar losing its facing can be checked only by "repointing" the joints with fresh mortar—not lime mortar this time but Portland cement mortar, which is practically imperishable and, if properly applied, will bond the bricks together where it touches them, besides effectively excluding moisture.

An amateur's attempt to repoint a wall will have a messy appearance if the methods of the professional bricklayer are not followed. Even if they are, the earliest effort may not be very satisfactory to the eye, but a little practice will bring a rapid improvement, and if the worker takes the precaution of getting his hand in on inconspicuous parts of the brickwork he may be quite pleased with himself when the job is finished.

Raking out.—The first operation is the raking out of the decayed mortar from the joints to a depth of ½ in.. to ¾ in. In some places the mortar may be hard near the surface, but ½ in. should be the minimum arrived at. The job will be less dirty and unpleasant if the wall is first sprayed with the garden hose to moisten the mortar. What is raked out should be caught on a board laid along the front of the wall and saved for digging into the garden beds, which will be benefited by the lime in it.



Repointing brickwork. (a) Showing joints that have been raked out. (b) Section of a struck joint. Cement mortar has been shown shaded. (c) Ruling off the lower edge of the horizontal joint. (d) Ruling off the upper edge of the horizontal joint

For raking, the worker will need a hook with its handle part long enough to be grasped with both hands. A large timber "dog" of ½-in. square steel does very well. The raking should be thorough, and the brick be bared at the top and bottom, or sides as the case may be, of every joint, so that the cement shall have clean brick to grip (*a* in the diagram).

The mortar consists of three parts fine builder's sand to two parts cement. After being thoroughly mixed dry, the material should be passed through a sieve of ⅛-in. mesh, to eliminate any lumps. Sufficient water is then added to make the mortar work easily without being sloppy.

Since the natural colour of cement is a somewhat staring greyish-white, it may well be toned down by the addition of vegetable black to a dark grey which suits both yellow and red brickwork. The black is added to the cement before the latter is mixed with the sand.

Tests should be made with small quantities, accurately measured, until the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

mortar, when twenty-four hours old, has the desired colour, which will be lighter than the wet mixture. When the correct proportions have been established they should be adhered to throughout the job.

For applying the mortar a small bricklayer's trowel will be needed, and to hold a pat of mortar close to the work the operator must provide himself with a "hawk," a square of wood, 7 in. on the sides, screwed through the centre to a handle 6 in. long.

Filling the Joints.—The vertical joints of a "length" are filled first. Small slices are cut off the flattened pat on the hawk with the back of the trowel and pressed in until a joint is filled. The surface is then smoothed off by a stroke towards one side, and any surplus cut off neatly with the edge of the trowel held vertically. At the top and bottom the mortar will have invaded the horizontal joints and should be smoothed down by running the tip of the handle along these joints.

At places where the old mortar has been raked out to an abnormal depth, it is advisable to fill in two stages, giving the first application time to set (not harden) before the surfacing coat is added. This applies equally to horizontal joints.

To fill the latter, the hawk is kept close to the work and the trowel used horizontally. The type of joint to be aimed at is the "struck" joint, shown sectionally in diagram *b*. At the top it lies back a little under the upper brick, and at the bottom is flush with, or extends slightly beyond, the lower brick.

Joints of this kind keep any water trickling down the wall on the surface. When smoothing down a joint, the upper edge of the trowel is therefore pressed in at the top, slightly under the brick.

Ruling Off.—When the horizontal filling of the length is completed, the top and bottom edges of the joints must be ruled off with a knife and straight-edge. The latter is a batten 3 ft. or so long and 2½ to 3 in. deep. On the wall side it has buttons or a strip to hold it away sufficiently to allow it to be tilted forwards or backwards.

The lower edge of a joint is ruled off just below the corner of the brick *c* and the upper edge a little way under the brick *d*. Some of the surplus mortar will fall away; the rest can be removed by sweeping the surface with a brush.

It is advisable to damp the brickwork well before applying the mortar, and to keep the wall moist for some days after the mortar has hardened. Dry brick, by sucking the water out of the mortar quickly, weakens the mortar's hold.

As in other work for which cement is used, boards and tools must be cleaned thoroughly before being put aside. If the cement is of the quick-setting variety, small mixings are advised until sufficient skill has been acquired to ensure a mixing being used up quickly, or if there is any risk of the work being interrupted for an hour or two.

ROPES, CARE OF.—Fibre ropes when stored away should be hung up in a dry, well-ventilated place, out of reach of rats and mice. If left on a damp floor they will quickly rot.

To take the twist out of a new rope, it should be well stretched before being passed through blocks.

Before a rope that has been laid by is put into use again, it should be carefully examined to make sure that it has not suffered any damage.

Soaking a rope in hot creosote or boiled linseed oil will enable it to resist wet, but at the same time reduce its strength. A new undressed rope can bear a load half as heavy again as one that could safely be put on a new dressed rope of the same size. Wet also decreases the strength of a rope, since, like the dressings named, it decreases the friction between the fibres.

A rope should have its ends "whipped" with twine to prevent them unravelling. To form a whipping proceed as follows. Turn up one end of the twine and lay it in the rope, pointing towards the tip. Bind several turns over it. Lay a loop of string over the binding, extending as far beyond it as the whipping is to go, and continue wrapping till the loop is almost covered. Cut off the twine, leaving a few inches of spare, and pass it through the loop, which is used to draw it under and out through the binding. Cut it off flush.

A rope should never be made fast to an object with sharp angles or rough projections, or passed round a hard corner, without being protected from chafing by soft pads or rounded blocks of wood.

A rope kept in an upper storey of a house as an emergency fire-escape should have knots tied in it about a foot apart. This will make the descent of it easier for an inexperienced person.

Wire ropes demand more careful handling than fibre ropes. A kink should never be allowed to form in one as it will probably do permanent damage. Sharp bends are damaging. A pulley over which a wire rope runs should have a diameter which is at least twenty times greater than that of the rope.

Rust, the great enemy of ungalvanized wire and steel ropes, can be prevented only by liberal lubrication with oil or grease, which will also make the rope run more easily. It is essential to be sure that the lubricant used is entirely free from acid.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

RUBBISH DESTRUCTORS.—An old water tank, in the bottom and sides of which a large number of holes have been punched inwards, makes a good destructor if supported on brick pillars nine inches high at the corners. Boards stood against the pillars on all but the windward side will promote an upward draught through the contents.

Another suggestion. Build two parallel walls of loose bricks, nine inches thick, two feet apart, and three and a half feet long. Across the walls lay parallel flat iron bars, half an inch apart, and build the brickwork up all round to a height of two feet or more, taking care to bond the bricks well at the corners.

Two of the walls will rest on the ends of the bars; the other two will be carried by bars which need to be of good strength or supported at intermediate points. The spaces between the bricks may be left open or be sealed with fireclay, used as mortar during the building.

Brick has advantages over metal in that it does not rust, is burned away more slowly and retains heat much better.

SASH CORDS, REPLACING.—The replacement of broken or worn sash cords is not so difficult a business as it may appear to anyone who has not tried his hand at it.

The beginner is advised, however, to make his first essay on a window with sashes of moderate weight and easily handled. Large sashes with heavy glass will require the assistance of at least one extra pair of hands.

Before embarking on a replacement, the worker must provide himself with a supply of new sash cord, which should be *well* stretched before use; some circular wedges —the tips of round-handled paste brushes do quite well—to drive in between cords and pulleys; and a "mouse," to lead a string over a pulley. The last is quickly made by wrapping some lead foil, such as tobacco is wrapped in, round the end of two or three yards of twine and binding it with strong thread. It must not exceed ¼ in. or so in diameter.

On the principle that the greater includes the less, we will assume that a cord on the outer sash has broken. If examination shows that the companion cord is probably of equal age, both the cords should be replaced, since getting out an outside sash is more of a business than renewing the cords of an inner one.

The inner sash is held in position by three beadings. The bottom one of these is not interfered with. The two side ones are prized away from the frame at the middle and bent until their ends are free. It is advisable to mark their ends before removal, so as to ensure that they should all be restored to their original positions. Pull the inner sash down and secure the cords by driving wedges between them and the pulleys.

The cord on one side, after the point to which its end reaches has been marked, is separated from the sash by levering the holding tacks out and a sash turned round and stood out of the way on a support, such as the backs of a couple of chairs, unless it is thought preferable to detach the other cord as well.

The next step is to remove the beadings between the sashes. These fit into grooves in the framework and are easily shifted if not stuck by paint. The inner sash is then pulled down and the cords wedged for the sash to be moved outwards and marks to be made on it opposite the cord ends. The cords are then separated from the sash, unwedged, and allowed to run back gently and lower the weights.

The last are got at by removing pieces of wood, called the pockets, which are held in place by the central beading. They are levered out by their top ends. The weights can then be withdrawn. Note how the cords are attached to them. Two different methods are used, and that employed previously must be copied.

The mouse is now passed over one pulley and used to draw a string down. The end of this is made fast to the sash cord, which is drawn up and over the pulley and the weight is put back in place. The sash is temporarily replaced and the weight is pulled up as far as it will go, wedged and cut off opposite the mark on the sash.

The same procedure having been followed with the other cord, both cords can be nailed to the sashes with a couple of tacks each. Then the wedges are removed and the sash run up and down to make sure that things are all right. If the sash drops a little when pushed right up, the cords are too long and must be shortened. On the other hand, an inner sash will refuse to close if the cords are too short.

But assuming that all is correct, nailing is completed, pockets and central beadings are replaced, and the inner sash has its cord nailed on and is put back into position. The replacement of the outside beadings completes the job.

Where the cords of an inner sash only require renewing, the removal operations described end with the detachment of the pockets or pocket, as the case may be.

The renewal of sash cords gives a good opportunity for easing a "sticky" sash; or for replacing a cracked pane of glass, a job which, in the case of the sashes of an upper-storey window, can be done much more easily when the sash has been removed than when it is in place. Now also is the

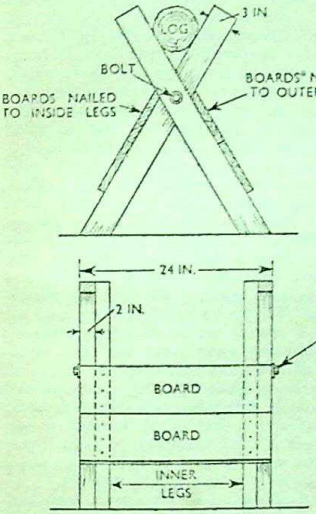
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

time for oiling pulleys, or renewing them, if badly worn.

SAWING-HORSE, MAKING A.—This useful accessory can be made quickly out of four pieces of 3-in. by 2-in. wood, each 32 in. long, and as many pieces of 1-in. board, 6 in. wide (see illustration).

The two ends are made first. Holes are bored 12 in. from what will be the upper ends of the legs, to take ½-in. bolts. The bottom ends are sawn off at an angle of 60° from the outer faces. Two boards 24 in. long, with their ends accurately squared, are nailed to the outer legs at such a height as to allow the inner legs to open until they make an angle of 60° with the



Dimensions for making a sawing-horse

outer. The inner legs are connected by boards 20 in. long.

If the construction be carried out carefully, so that the parts are quite square and parallel, the horse can be closed up after loosening the nuts, for storing away.

SAWS AND THEIR USE.—Saws are important—and often much-abused—items of a household tool equipment. The professional includes in his outfit a *rip saw*, with large forward-raking teeth for ripping, that is, cutting along the grain; a *cross-cutting saw*, with smaller teeth set slightly back in front, for cutting across the grain; a *panel saw*, with still finer teeth and a selection of very fine-toothed *tenon saws*, also called back saws because their thin blades are stiffened by a stout steel or brass

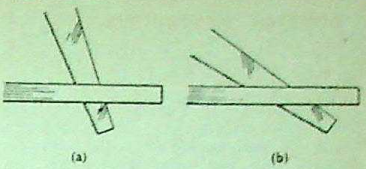


Fig. 1.—(a) Saw nearly upright and cutting on the short face easily. (b) Saw is sloped too much and the cutting face is too long, making harder work

bar running along the back or top edge. Panel and tenon saws are intended specially for cross-cutting, the first being specially useful for close cutting in large stuff and the latter for doing the same in small work.

The craftsman will also have provided himself with a *dovetail saw*, a small edition of the tenon saw, with very fine teeth; *compass*, *pad* or keyhole, and *bow* or frame saws for cutting along curved lines.

For ordinary household purposes, however, one may limit one's purchases to: a 26-in. hand saw with five teeth to the inch, the teeth modified in shape for both ripping and cross-cutting, a 22-in. panel saw, with nine teeth to the inch, and a 12-in. tenon saw having twelve or fourteen teeth to the inch.

If there is a likelihood of much log-sawing having to be done, it is advisable to invest in a saw, single or double-handed, with teeth specially designed for the purpose. It should be realized that much labour and trouble will be saved if the saw suitable for a particular job is used, and not one less suitable, and that muscular effort will be greatly reduced if saws are kept sharp and properly set—operations which had better be entrusted to the professional — and free from rust, which increases friction. A little vaseline or other grease applied to a saw before it is used on cutting thick stuff will make it run more easily.

Before cutting up wood that has already been in use, examine it carefully for nails and screws, which, it need hardly be said, are very destructive of teeth.

A tenon saw should have its teeth protected when it is not in use by a shroud made by sinking a cut ½ in. deep into one edge of a thin strip of wood.

Accessories.—There are two things which greatly assist sawing operations. The first is a proper *sawing-stool*, which any joiner will make for a reasonable sum; and the other is a *bench-hook*, easily constructed at home, for use when cross-cutting small stuff on the bench. A hook is quickly made by nailing slats to the ends of a 12-in. by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

8-in. piece, on opposite sides. When it is laid on the bench the under slat prevents the hook moving forward as a whole, while the other acts as a stop to the wood being sawn.

Using Saws.—It is a good rule to think twice before cutting once. Assuming that a board has been marked down the centre for division into two equal parts, the saw should follow the mark—cut it out—the kerf, or cut made by the saw, lying equally in both parts. But if part of the board is needed for a special purpose, the cut should be made in the "waste" part, a little distance from the line, to allow for planing.

Again, in cross-cutting, it is necessary to cut close up to the line, so that little if any work on the wood with other tools may be needed. In delicate work the marks for cross-cutting should be made with the corner of a chisel, and a sharp shoulder will be ensured if the chisel cut is made vertically to a depth of ⅛ in. or so, and a second cut be made towards it at an angle in the waste, to form a triangular groove. The saw will then have a definite guide.

A saw can be steered more accurately if the first finger be extended along the side of the handle, which is gripped by the other fingers and the thumb.

When starting a cut, use the left thumb as guide and rest the saw lightly on the wood during strokes until a nick has been made. At this stage the saw is held at an angle of about 45° to the work.

For *ripping*, keep the saw almost vertical after it has entered, so that the "face" being cut is short (Fig. 1, page 605). A sloping long face means hard work and slow progress. Where thick stuff is being sawn, keep altering the cutting angle slightly. The head should be held over the saw, so that both sides of it may be visible, and the whole arm moved in a vertical plane.

The tendency is to swing the elbow sideways, causing the saw to press on the sides of the cut and cause excessive friction. Should the saw stray from the correct line, keep it upright and during downward strokes give it a twist in the direction needed until it returns to the proper path.

If the saw gets pinched, relieve it by driving a chisel or wedge into the cut some distance from the saw and moving it forwards as the saw progresses. But when the end of the cut is approached the wedge should be removed, lest it should split the wood, and the part not pressed on by the knee should be supported by the left hand till the saw comes through.

When making a long cut, support the sawn part on a second rest. Use all the teeth, except those near the end of the blade, to distribute wear as widely as possible. Care must be taken, however, not to let the tip come up into the work, lest it should catch and the saw be badly buckled by the next stroke. A buckled saw, by the by, should be handed to an expert for straightening, as the job cannot be done by an inexperienced person.

Cross-cutting. — The work should be marked on the sides as well as the top, except where very thin stuff is in question, and an eye be kept on both the side marks. If this precaution be omitted there is a danger of the cut being slanting on the far side, though it may be vertical on the nearer side.

In starting a cross-cut, enter the saw as for ripping, and then gradually lower its handle end until the cut extends right across the top. For square or thick stuff the cut may well be carried to a slight depth down both sides, to give the saw a lead. A tenon saw should be used gently, as it easily buckles, and never be employed on work that can be done by a stouter saw. Care is needed in finishing the cut to avoid tearing the fibres. It is advisable to support the work on a piece of waste wood while the saw is making the last strokes.

Sawing Metal.—This is usually done with a hacksaw, which is a fine-toothed blade stretched tightly in a frame like that of a fretsaw, but much stouter and shallower (Fig. 2). Saws ¼ in. wide and with eighteen teeth to the inch are recommended. They may be from 9 in. to 12 in. long. A saw is set in its frame with its teeth pointing away from the user, so as to cut on the downward strokes.

A hacksaw blade is highly tempered and snaps easily if it jams, and the teeth break away easily if they catch on thin metal. The work should therefore be held firmly in a vice and the saw be held at an angle which gives it a long face to bite on.

Before using a hacksaw, make sure that the blade is stretched tight. Do not let the number of strokes per minute exceed forty: too rapid sawing overheats the saw. Be careful to make straight cutting strokes and to press lightly during the return strokes.

When cutting a pipe or tube, mark it all round with the saw and deepen the cut while revolving the part, until the saw is almost through everywhere, when the cutting may be completed straight through. There will then be no danger of teeth "straddling" metal thick enough to damage them.

A hacksaw and some spare blades should

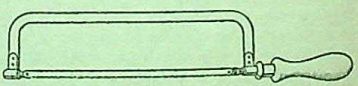


Fig. 2.—Hacksaw of conventional design

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

be kept in the house, as the tool will often come in useful. Lead and copper can be cut with an old tenon saw that has become too blunt for its proper work. Wide blades sold for use in an ordinary fretsaw frame are handy for cutting thin metal along curved lines.

SCREWS AND SCREWING IN METAL WORK.—Screws for holding metal parts together have countersunk, round, or cheese-shaped heads. For sizes below $\frac{3}{8}$ in. in diameter screws cut with the B.S.F. thread are recommended; and for larger sizes those with British Standard Whitworth threads.

Holes through which "metal" screws have to pass must be bored to the full size of the screw in the held part and be of the smaller "tapping" diameter in the holding part, to allow for threads being cut in the surrounding metal. A tapping plate is needed for the selection of the proper size of drill for the smaller hole. It contains pairs of holes, one of a pair just allowing the screw to pass, while the other fits the drill that should be used for the hole that has to be tapped.

Taps for cutting threads are sold usually in sets of three for each size: a "taper," for starting the thread, a "second," for opening it out, and a "plug," for cleaning to full size. In thin metal the first only may be needed. It should be worked in just far enough to allow the screw to enter rather stiffly.

A tap should be well oiled before use and be rotated to right and left with a tap wrench. Taps, being of highly tempered steel, are brittle and liable to snap if unduly forced. It is better to enlarge the hole slightly with a broach than to risk breaking the tap.

If a number of screws are needed to hold two parts together, it is of the greatest importance that the holes in both parts should register exactly. If they do not, some of the screws will refuse to enter until the holes in the held part have been enlarged. The two parts should be clamped firmly together and bored with the drill of tapping size. The holes in the held parts are then enlarged to full size with a larger drill, a broach or a reamer.

SEWING MACHINE, CARE OF.—Although sewing machines are extraordinarily efficient, they are not made to stand rough treatment. Because a machine does not go quite so well as usual it is not necessarily the fault of the machine. It may be that the user has neglected to treat it properly.

Adjustments may often be made by the mere twisting of a screw, or possibly the cotton is too coarse for the material. The needle may be of the wrong size, or the stitch too small for the thickness of the material. These are things which give trouble quite frequently.

Tension.—The thicker the material, the coarser the cotton needed and the larger the needle. The size of the stitch also depends on the material. For thick fabrics a fairly large stitch will be required, while for silks a much smaller one. To alter the tension of the upper thread adjust the screw near where the needle is threaded. The lower thread is regulated by loosening or tightening the screw in the shuttle. The slightest touch of these screws will have effect.

First try the stitch on a double piece of the material to be used so as to make sure that the stitch is the right size and that the tension is correct. Sometimes loops of cotton appear on either the right or the wrong side of the material. This means that the tension is wrong. If it is wrong on the top of the work alter the screw on the machine, and if underneath the work, the screw on the shuttle.

When the Cotton Breaks.—For working on thin materials it is advisable to put a piece of tissue paper under and sew through it. This will tear off easily afterwards and will prevent the material from puckering. When machining over a thick seam it is necessary to go slowly and to help the material along with the left hand. Most machines are provided with various attachments such as hemmers, tuckers, etc., and these are very useful and save much time, though with some materials and for certain garments it is more satisfactory to do the hems by hand.

A blunt needle, or one with too sharp a point, will make the work seem difficult and also spoil the material. At times the cotton breaks easily. This is not necessarily proof of inferior quality. First see that the needle and bobbin are threaded correctly. If these are satisfactory, it may be that the tension is too tight or the needle-point bent and rough, or perhaps the needle is not in securely. Possibly the machine is dirty or lacks oil, which is essential for even running. Uneven stitches and jerky running also indicate that an application of the oil-can is needed.

It is an excellent rule to tack everything before machining. Pins are time-savers, but care must be exercised when they are used to see that they do not get into the machine or in the way of the needle and thus cause it to break.

It is a common but erroneous belief that when the machining is finished all that is necessary is to cut the two threads. By doing this the work will not be secure.

The reverse is the firmest way of finishing off. Turn the material and work

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

over the previous stitches. With some materials, however, it is better to leave sufficient cotton or silk to fasten off by hand or to tie on the wrong side. Certain things, such as hemming a cross-way piece, etc., are better done by hand.

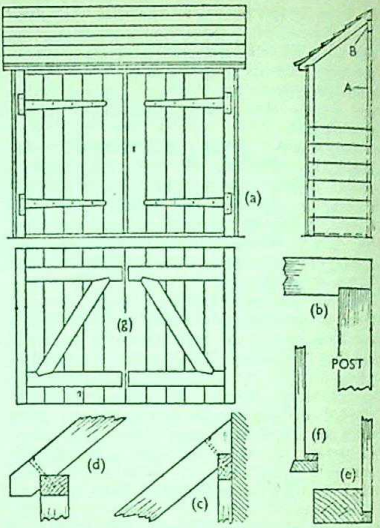
Oiling.—After using the machine there is bound to be a certain amount of dust and fluff from the material left on it. This will not improve the mechanism, and must always be wiped off before placing the cover on. It is just as necessary to dust before use because the oil is liable to work out and stain the material.

The oil-can is the most important accessory to any machine, and should be applied regularly. While it is necessary to put oil in all the little holes provided for the purpose, it is injurious to put too much because it will clog the works or overflow. To oil inside and underneath the machine, the screws which attach the metal part to the wooden base must be unscrewed. The top will open like the lid of a box. Leave the oil to soak in, and then clean thoroughly.

SHEDS, TOOL AND CYCLE.—The illustration gives details of a lean-to shed, suitable for keeping tools or a bicycle in. It measures 2 ft. 6 in. in depth, 6 ft. in height to the eaves, and 7 ft. in length. The roof has a rise of about 2 ft. The back is attached to two uprights of 3-in. by 1½-in. batten (A in the end view of the shed), supporting a ridge-piece, B. All three are nailed firmly to the wall.

The front posts are of 2-in. by 2½-in. stuff, sunk 6 in. into the ground after their bottom ends have been well creosoted. Should the shed be erected on a cement or other hard surface, the front posts are connected with the back posts by battens. And in either case there will be a batten joining the front posts for the doors to shut against. The parts are held together by skew-nailing.

The top bar of the front, above the doors, is shouldered at each end to fit over the tops of the posts (shown in *b*). The notching of the ends of the rafters to engage with their end supports is explained by diagrams *c* and *d*. When the four or five rafters needed have been fixed, the framework is ready for the roof of weather-boards, or of matchboards covered with felt. The boards should overhang the shed a couple of inches at each end. The joint between wall and roof is made watertight by scraping out the mortar between the nearest courses of brick to a depth of an inch, and cementing in a strip of zinc extending a few inches over the roof. If the ends are weather-boarded, the boards should not extend quite to the front, to allow their rough



Tool or cycle shed. (a) Front and end views. (b) Junction of top plate and post. (c, d) Showing how rafters are notched to supports. (e) Use of beading (dark) to hide ends of weather-boards. (f) Detail of door bottom closing against sill. (g) Position of "brace" to prevent sagging

ends to be hidden by beading, as shown in diagram *e*.

The *doors* are made of matchboards. The boards should have about ½ in. spare at each end, and a door be reduced to its final length by saw-cuts following ruled lines. This will ensure the top and bottom edges being straight and neat. The boards of a door are nailed to ledges set in 3 in. from the ends. Put nails in from the front and clinch on the ledges.

A door is prevented from sagging by a "brace" (*see* Fig. 1*g*), notched top and bottom into the ledges. Note that the bottom end is nearer than the other to the hinge edge of the door. Cut the brace first and mark out notches from it. A close fit is needed for the brace to do its work properly.

The doors are hung on long "cross-garnet" hinges; and the vertical joint between them is made weatherproof by a strip nailed to one and overlapping the other. If a floor is desired, the boards are nailed to 2-in. by 2-in. battens, a foot or so apart. It need not be fixed to the framework.

SHED WITH GABLE ROOF.—A large shed, standing away from any other

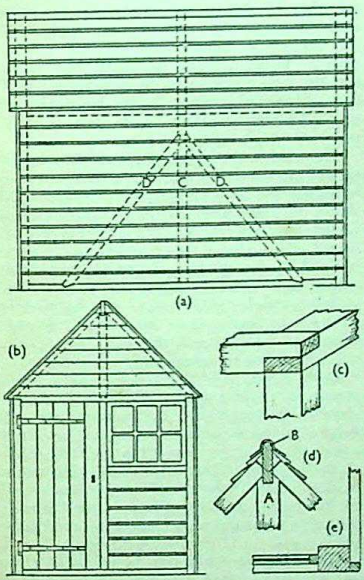
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

building, is shown in the diagram. It has a gable roof and a door and window at one end. If, as is advised, such a shed is so designed that sides, ends and roof have separate frames screwed or bolted together, it will be easily transportable. Construction will, however, be quicker if the shed is assembled as a permanent fixture.

The posts and studs (intermediate uprights) are of 3-in. by 2-in. deal. If the shed is to be portable, the ends should fit into the sides; if to be a fixture, the top "plates" of the frames are halved at corners and nailed to tops of posts, as shown in *c*; and the same joint is used for the "sills" at the bottom. The sides are stiffened by a central stud C (diagram *a*) and two braces, D D, notched into the stud and sill.

The roof has at each end a centre post, A (diagram *d*), notched into the plate at the bottom, and itself notched at the top for a ridge-piece, B (diagram *d*), to which the upper ends of the rafters are nailed. Fit one pair of the rafters very carefully, and work off all other pairs from them. Then nail the two end pairs, beginning at the lower end, and add the others. The ridge is made watertight by a zinc capping.



Gable-roof shed. (a) Side view, showing centre stud, C, and struts D, D. (b) End view. (c) Junction of plates and corner post. (d) Detail of ridge of the roof. (e) Fixing weather-boards at corners

The bottom frame of the shed should be raised at least 3 in. above the ground on bricks or wooden joists so that there may be free circulation of air under the floor and framing.

Assuming a ready-made window to be fitted, this should have been purchased from a builder beforehand, to ensure that the design shall admit of its insertion. A quite serviceable window may be made out of an old oak picture-frame, with a sheet of glass puttied into it.

SINK TRAPS.—These sometimes become blocked with grease, tea-leaves and other small rubbish which finds its way through the grating. Boiling solutions of soda or salt are useful for detaching grease. Hydrochloric acid mixed with twenty times its bulk of water may also be tried. Add the acid to the water—not vice versa.

Should the grating be removable, a stubborn blockage may be shifted by rolling a cloth up into a ball large enough to fill the trap and tieing it round with string, the end of which will be used to withdraw it. The trap is filled with water, and the ball is inserted and pushed down suddenly with something which fits the trap loosely. The pressure will clear the obstruction.

Every trap under a sink or fixed basin has—or should have—a screw-plug at its lowest point. The removal of this gives access to the inside, and a hook can then be inserted to scrape any accumulated matter into a bucket or pan placed beneath. When the plug has been replaced it should be tested for watertightness.

SOLDERING. — Many people regard soldering as requiring a great deal of skill and beyond the capacity of the ordinary householder. This may be true of "hard" soldering, for which solders containing silver or brass and the intense heat of a blowpipe are needed. But to make satisfactory joints with "soft" solders—mixtures of lead and tin—is easy enough, provided that certain necessary precautions be observed.

It is with "soft" soldering that we are concerned here. By means of it parts made of brass, copper, or iron are easily joined together. The beginner is, however, advised not to pit his skill—or lack of it—against articles of tin, pewter or zinc, as these metals melt at a low temperature and require the use of very fusible bismuth solders.

Outfit.—The three essential items of a soldering outfit are: (1) a *bit* for melting the solder and drawing it along a joint; (2) a *solder* which melts at a reasonably low temperature, say 350° F.; and (3) a

 CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flux which assists the solder to adhere to clean metal.

The head of a bit is made of copper, and held in an iron shank fitted into a wooden handle. For ordinary household repairs it is advisable to select a bit with a large head containing a pound or more of copper, and another of much smaller size for the more delicate operations. Though slow to heat and clumsy to handle, the large bit retains its heat a long time, which is an important quality in many cases—as when a long joint has to be "run."

Solder should be bought in the thin stick or wire form, which is preferable, as regards convenience and economy in use, to thick sticks.

Perhaps the most widely-used soldering *flux* is chloride of zinc, made by dissolving scraps of zinc in "spirits of salt"—commercial hydrochloric acid—until gas ceases to come away. The acid is then said to have been "killed," and is ready for use after it has been strained through calico. The "killing" should be done out of doors, as the gas given off is very noxious; and the bottle in which the liquid is stored should be labelled "Chloride of Zinc, Soldering Flux, Poison."

For copper and brass this flux is excellent, but it corrodes iron if the acid is not neutralized after the soldering operation by a good washing with a solution of washing soda. So for general use the reader may wisely invest in a bottle of non-corrosive soldering fluid such as Baker's, which is obtainable at the majority of ironmongers.

For very small work, mixtures of powdered solder and a flux, sold ready for use, come in handy. But wherever possible a joint made with stick solder and separate flux should be preferred.

Other useful items of the outfit are: a rag for cleaning bit and work; a coarse-cut file on which to brighten the tip of the bit; and two old cups for holding soldering fluid.

Using the Bit.—We will begin with a very simple operation—the stopping of a hole in the bottom of a kettle. A newspaper is spread on the table, and on it are placed the bottle of flux, the two cups, cleaning rags, file and solder. Flux is poured into the cups to a depth of half an inch or so, and the bit is thrust into a clean fire, or placed over a burner of the gas cooking-stove, to heat.

The hole in the kettle is now enlarged till sound metal has been reached all round, and a circular patch is cut out of "tin"—otherwise tinned iron—large enough to cover the hole and extend beyond it at least ¾ in. in all directions. The metal round the hole is then scraped bright over an area larger than the patch.

This part of the work cannot be done too thoroughly, as the slightest suspicion of dirt is sufficient to prevent solder gripping the metal. Improperly cleaned surfaces are the most frequent cause of soldering failures. To make things more certain, scrape also the side of the patch which will be in contact with the kettle. Next, moisten the patch and the scraped part of the kettle with soldering flux, applied with the end of a stick of solder.

By this time the bit should be hot enough for use. The usual test is to hold it near the cheek. A little practice will tell you when the warmth felt indicates that the bit has been heated sufficiently. Rub any adhering soot off the tip by brushing it smartly with the rag, and quickly file the tip bright all round.

The simplest way of doing this is to have the file flat on the table and move the tip over it. If the metal darkens again at once to a purplish black, it is too hot, and must be left to cool till it remains bright after filing. Then dip the tip into one of the cups, which will be reserved for this cleaning operation, dip a stick into the other cup, and at once apply it to the bit, till a small blob gathers on the point. When dipped into the acid again the tip will be covered in a moment with the solder, or "tinned," and be ready for use. An untinned bit is of little, if any, use.

The metal round the hole must now be tinned in turn, by melting solder on to it with the bit and spreading it about. The patch is then laid in place and pressed upon with the bit until solder exudes all round its edges. If a doubtful spot is noticed in the joint, melt on a little more solder and draw it right round the edge of the patch. As soon as the solder changes in appearance from bright to dull after the removal of the bit, it has set, and the joint is completed.

Long Joints.—If the mechanically folded joints of a tin canister have to be made absolutely watertight, the metal is scraped bright on both sides of the joint and the point of a bradawl drawn along the crack to dislodge any dirt. After the application of flux small blobs of solder are melted on at intervals, and the bit is drawn slowly along to distribute the blobs evenly in the joints.

Assuming the metal to be clean and the bit hot enough, the solder will follow the bit very obediently, and no difficulty will be encountered.

Filling Cracks.—In cases where metal has been split by a blow or hard usage, the edges of a crack must be very carefully

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cleaned before solder is applied. It may be necessary to enlarge the crack by driving in a wedge-shaped tool—such as a screwdriver—till the edges are turned up sufficiently to be got at. When they have been scraped, they are beaten flat again.

If there remains a gap too wide for the solder to bridge, it should be bridged by a piece of bright brass wire of the proper size to fill it when driven in.

Soldering without the Bit.—The flame of a spirit-lamp or gas-burner can be used to supply the necessary heat in many cases. A patch on a kettle bottom, for example, can be affixed by inverting the kettle over a spirit-lamp while it is being tinned and the patch pressed down. Small parts may be joined by tinning the surfaces which will be in contact, and clamping them together for heating in a flame till the solder runs. The lead-cum-tinfoil used for wrapping sweets, tobacco, etc., comes in handy as a solder if sandwiched between flat surfaces that need soldering together.

Where a joint has to stand a heavy strain the solder should be run right through by heating till it shows on the farther side.

General Hints.—If the solder becomes ridgy, the bit has cooled too much and must be re-heated.

Do not attempt to solder small pieces to a large mass of metal until the latter has been heated to the solder's melting-point.

Parts are joined most easily if tinned separately beforehand.

Parts can be tinned very quickly by dipping them first into flux and then into a vessel containing molten solder.

The flame of a spirit-lamp, directed by a blowpipe on to the joint, is very useful in some cases, especially where delicate work has to be done.

STAPLES, A HOLDER FOR DRIVING.—The tiresome business of driving small staples is made simple enough if the little tool to be described is provided.

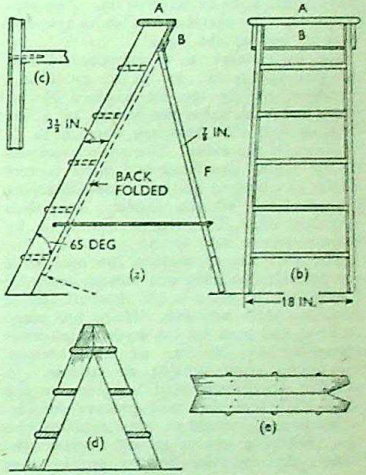
Procure a bar of steel as large through as the width of a staple. In one end cut, with a hacksaw, a slot $\frac{3}{8}$ in. deep. Red-heat the end and drive into the slot something which will widen it sufficiently to admit a staple easily; or open it with a very thin jeweller's file. The slot is then closed in at the edges by surrounding the end with a well-fitting piece of brass tube $\frac{1}{2}$ in. long, soldered on; if this is not available, by winding wire round it, and soldering. Magnetize the end by stroking the bar with one pole of a permanent horseshoe magnet, all strokes being made in the same direction.

For driving, a staple is slipped into the slot, in which it will be held by magnetization while the projecting points are brought against the wood and forced in by a blow on the back end of the bar. The bar is then removed, and driving is completed in the usual way.

STEP-LADDERS. — A step-ladder, or pair of steps, as it is otherwise called, is an important item of the household equipment which any amateur joiner of fair skill can easily put together.

That shown in side view in diagram *a* stands 3 ft. 8 in. high when extended. For the sides are wanted two 4-ft. 3-in. lengths of wood measuring $3\frac{1}{2}$ in. by $\frac{7}{8}$ in. after planing. The top, A, is 18 in. by $5\frac{1}{2}$ in. by $\frac{7}{8}$ in. The treads or steps are of 4-in. by $\frac{5}{8}$-in. board.

The carpenter's bevel is used to draw lines near the ends of a side at an angle of 65° to what will be the front edge. The lines are 4 ft. apart. Cut off top and bottom, and work off the second side from that cut first. The two sides are now clamped together and a line is squared across their front edges $6\frac{1}{2}$ in. from the top; and below this four other lines, $8\frac{1}{2}$ in. apart. Below each of these five lines rule a second, $\frac{7}{8}$ in. away from it. The boards are then separated, and the ten marks used to rule lines across what are to be their inside faces, at an angle of 65° to



(a) Side view of a pair of household steps. (b) The front view. (c) Detail of insertion of the end of the tread showing beading cut in the edge of the side. (d) Side view of library steps showing the treads in section. (e) Library steps shown folded

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the front edge, and therefore parallel to the top and bottom lines.

Cuts are sunk just inside the lines to a depth of ¼ in. with a tenon saw "blinded" by strips overlapping its ends and screwed together, so that it cannot enter more deeply. The waste between the pairs of cuts is then chiselled out or removed with a router, and the grooves to take the ends of the five treads have been formed.

After rounding off their corners, so as not to damage the board, lay the sides on edge on the floor, on either side of a centre line, from which their top ends should be 8 in. (measuring to the outside) and their bottom ends 9 in. Having got the position correct, and the tops in a line square with the centre line, tack pieces across the ends and blocks to the floor to prevent spreading. Then cut the pieces for the top and bottom treads, as measured from the bottom of the grooves. The back of each tread is bevelled to an angle of 65°; and the front edge is rounded off and sloped a little at each end to meet the sides, beyond which it projects a little. Slide the treads into place—they should be a tight fit—and secure them to the sides with two long screws at each end. The middle tread is then fitted, and finally the remaining two.

The ladder is then turned over for the hinge-piece, B, to be screwed on. The top, A, can then be attached. This is rounded in front and at the ends.

The back frame, F, is composed of two side-pieces, 40½ in. by 2 in. by ⅞ in., connected at the top by a piece 3½ in. wide, and 4 in. from the bottom by a bar 2 in. wide. The bars are tenoned to fit mortises in the sides. The exact positions of the tenon shoulders and their correct angles can best be got by tacking the sides to the back of the ladder, and then marking off. The tenons are held by wedges driven into them.

The butt hinges holding the back to B are arranged to have one bottom screw in a side and the other in the top bar, and so hold the parts together. Holes are bored in front and back for the cords which limit spreading to 36 in. at the bottom, measuring from outside to outside. A smarter appearance will be given to the steps if, before the tread grooves are cut, a beading is formed on the front of each side, with its groove as far in from the inner edge as the bottom of the step grooves.

A pair of Library Steps is shown on p. 611, diagrams *d* and *c*. When open it is 2 ft. high. There are three treads on each side, the top ones together forming a tread of double width when the steps are opened. In diagram *e* the steps are seen closed. The materials are ⅞ in. thick; the sides 3 in. wide; and the treads 3½ in. wide. At the bottom the steps have a 22-in. spread overall.

The length of a tread is 18 in. In this ladder the sides are vertical. To mark out a side piece, draw on the floor a centre line and two parallel lines across and at right angles to it, 24 in. apart. Make a mark on one line 1½ in. from the centre line, and another on the other line 11 in. away. A piece is then laid up to these marks, on the centre-line side, and ruled for top, bottom and vertical meeting-face. The other three pieces are marked from it. Construction then follows the course already described. The two halves of the ladder are united by a "strap" hinge inside the angle, as shown.

One leg of the hinge has to be secured with countersunk-headed bolts, as getting screws into it would be a very tedious business; or a pair of the special hinges sold for such a purpose may be used. These are screwed on to the outside faces of the sides.

SWING, A GARDEN.—The framework for a swing is made out of two uprights, A A (shown in the illustration on the opposite page), of 7-in. by 3-in. wood, 11 ft. 3 in. long, connected at the top by a crossbar of 7-in. by 3-in. wood, and below ground level by two 8-in. by 1½-in. boards, B B, 6 ft. long, nailed on to both sides.

The uprights are tenoned through C and firmly wedged, the joints being first well smeared with white lead paint to prevent water entering. Two short boards, D D, are nailed to the bottom ends of the uprights to prevent any settlement after the swing has been erected.

All underground parts should be well creosoted before being buried. In selecting the timber make sure that it is sound and free from large knots. A weak place in an upright near ground level, where the strain is greatest, might cause the wood to break.

The uprights are 4 ft. apart, and C is long enough to overhang them 4½ in. at each end. On the top, C is bevelled from the centre line towards each edge, to throw off the rain.

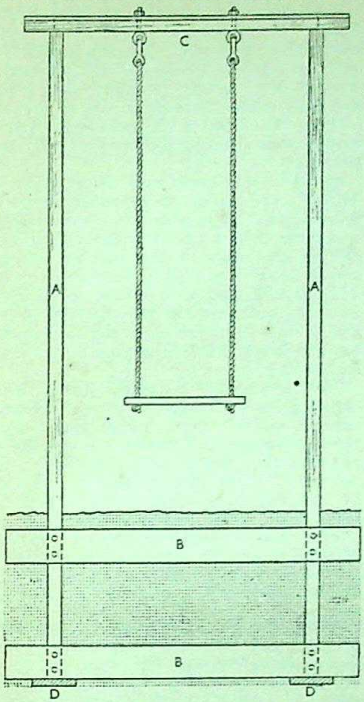
Two large eyebolts are fixed through the crossbar, 18 in. apart, for hooks at the end of the swing ropes, which will then be easily removable. The ends of the bolts should be burred over the nuts to prevent these loosening.

The framework is buried 3 ft. deep in the ground and packed with stones, brickbats and earth, wetted and rammed hard. The packing should be given a week or two to settle before the swing is used.

For the seat use a board 9 in. wide.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Appearance of a completed garden swing

2 ft. long, and 1½ in. thick. All edges should be well rounded off.

TIMBER, SIZES AND SELECTION.—Deals, battens and boards are sawn to certain standard dimensions with which the amateur should be familiar, so that in planning out work he shall not include parts of unusual thickness or width, which must be worked down from larger stuff.

Deals 4 in. thick are sold in widths of 11, 9, 8, 7 and 6 in. Deals 3 in. thick have widths of 11, 9, 8, 7, 6, 5½, 5, 4½ and 4 in. Deals 2½ in. thick run 9, 8, 7, 6, 5 and 4½ in. wide.

Boards are 11, 9, 8, 7 and 6 in. wide, and 1½, 1¼, 1, ¾ and ⅝ in. thick.

These measurements all apply to timber in the rough. If machine *planed* or "finished," they are, of course, smaller by the amount removed by the plane. Thus, a 9-in. by 1¼-in. board will measure, say, about 8¾ by 1⅛ in. when planed.

Quarterings—so useful for framing outhouses and for a great deal of indoor and outdoor work—are sold at any timber yard with sections (in the rough) of 4 by 3 in., 3 by 3 in., 3 by 2 in. and 2 by 2 in.

Matchboard is sold in 6, 5, 4½, 4, 3½ and 3-in. widths. The effective width is about ½ in. less than the nominal, as the tongue and the edge planing each take ¼ in.

Selecting Timber.—Freedom from knots, straightness of grain, and evenness of colour are desirable qualities. The closer the annual rings are together, the better, for slow-growing trees yield the best timber. The rings are closer together in heartwood from near the centre of the tree than in the outer and less valuable sapwood.

Many planks contain some sapwood, and they should be rejected if the sapwood has a bluish colour, which indicates that the timber was cut while the sap was up and, so far as the sapwood at least is concerned, is not likely to prove durable.

Uses of Different Kinds of Timber.—The wood of the northern pine, commonly called Scotch fir, and known as *red* or *yellow deal*, is so strong, light, durable and easily worked that it is used more than any other timber for joinery and house construction. It is also a favourite for outdoor work, as it withstands decay a long time if not permanently damp.

"*White*" deal, the product of the Norway spruce, is inferior to yellow deal, as its knots are very hard, it shrinks and warps much more, and does not stand wet so well. It is, however, widely used as a cheap substitute.

Larch is very tough and resists weather well, but is difficult to work and bad for shrinking and warping. It may be selected for fencing, posts, and rough outdoor work generally.

Yellow pine is an excellent wood for indoor use, being soft and easily worked.

Where a combination of toughness, strength and durability is of chief importance, *oak* takes first place. It is ideal for posts set in damp ground, and for fencing, while its beauty and ease of working make it very valuable for joinery and furniture.

Elm is a very cross-grained wood and difficult to work, but it is excellent for wheelbarrows, trucks, etc., as it is very tough, and there are few better woods for use in damp places.

The amateur should bear in mind that most timber nowadays requires a licence for its purchase and use.

TOOL OUTFITS.—A great deal of rough outdoor work can be done with no more equipment than a hand-saw (Fig. 1*f*, p. 614), hammer, rule and pincers. The hammer should have a curved, forked back for pulling out nails. For general work indoors additional tools should

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

include: large and small *bradawls*, a medium-sized twist *gimlet*, a *carpenter's square*, large and small *screwdrivers*, a 1-in. *chisel*, a *jack plane* (Fig. 1*b*) with iron 2⅜ in. wide, a pair of wire-cutting *pliers* and a good *oilstone* for sharpening the edge tools.

Anyone who intends to make woodworking a hobby will have to extend the list considerably. For truing long joints a *trying plane* will be needed (Fig. 1*a*), and for smoothing large surfaces a *smoothing plane* (Fig. 1*c*). For fine cross-cutting a *tenon saw* (Fig. 1*g*) is essential. A *bench hook* (Fig. 2*b*) assists cross-cutting, and a *shooting board* (Fig. 2*c*) the truing of edges. A *holdfast* (Fig. 2*e*) and a *clamp* (Fig. 2*f*) are very useful for holding parts firmly to the bench while being worked on; and a *marking gauge* (Fig. 2*d*) cannot be omitted.

The Bench.—Though the kitchen table suffices for a good deal of useful carpentering, a proper bench enables many jobs to be done neatly and easily which could hardly be done without it. That illustrated by Fig. 2*a* could be put together by any handy person. The legs are of 3-in. by 3-in.

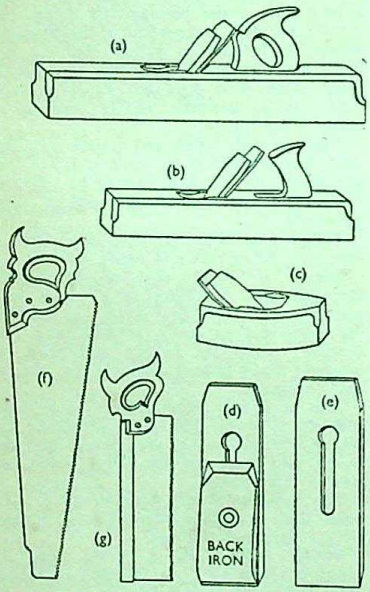


Fig. 1.—(a) Trying plane. (b) Jack plane. (c) Smoothing plane. (d) Plane iron and back iron assembled. (e) Plane iron. (f) Hand-saw. (g) Tenon saw

yellow deal, the framing of 5-in. floor-boards for the upper frame and 3-in. battens for the lower. The top is of 2-in. deal or birch (this is the better wood) screwed down to the framing. The back and ends can be boarded in and a drawer for tools fitted under the top; or a trough may be formed at the back of the bench, as shown.

At the right-hand end is a turn-up "stop," very useful for supporting a part being sawn. It is a piece of hard wood, measuring 6 by 2 by 1 in., screwed at one end of the edge of the bench. When turned down it is flush with the top; and when turned vertical it comes up against another piece, nailed to the edge behind it. The piece A has holes for a peg to support one end of a board held on edge in the vice for planing.

The vice, a very important fitting, will save a great deal of time if of the "instantaneous action" type, which leaves the moving jaw free to be pulled out or pushed against the work when a catch is depressed. Near the left-hand end should be an adjustable *bench stop*, to hold a board while being planed on the flat.

The chisels should include a *mortise chisel*, ¼ in. or ⅜ in. wide, as it is essential for cutting mortises; and, as chisels should not be struck with a hammer, a *mallet* is needed.

Boring Tools.—Besides an assortment of gimlets and bradawls, fairly advanced woodworking will call for a *brace* to hold the narrow "*spoon*" or "*pin*" *bits* needed for making small holes up to ¼ in. diameter in hard wood or deep holes in all kinds of wood; *centre-bits* from ¼ in. to 1½ in. across for boring across the grain; and *twist-bits* with corkscrew-shaped shanks and gimlet tips for large, deep holes and boring along the grain. All of these have tapered square heads fitting the brace. The best and most expensive braces have ball-bearing heads, and a reversing ratchet which is useful in corners or other places where the brace cannot be turned round and round.

Boring tools include the *countersink*, used in the brace to bevel the end of a screw-hole so that the screw's head may enter flush with the surface of the wood.

Other Tools.—The following should be added when possible: a *compass saw* and a *padsaw* for cutting curves and enlarging openings respectively; a *rebating plane* for cutting rebates; a *plough* for cutting grooves along the grain; a *router* for clearing away the wood between saw-cuts across the grain when making a groove; a *carpenter's bevel* for marking off angles; a *mortising gauge* with twin points, to mark off the two lines for a mortise simul-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

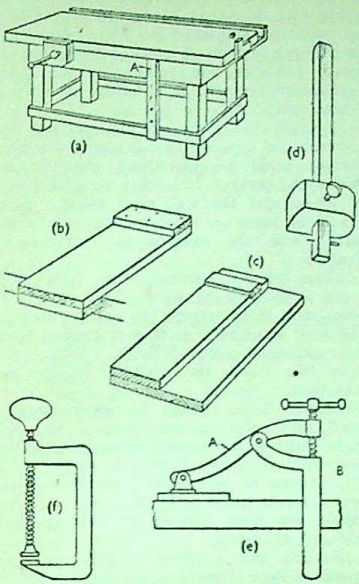


Fig. 2.—(a) Carpenter's bench. (b) Bench hook. (c) Shooting board. (d) Marking gauge. (e) Holdfast, shown with tail B pushed into hole in bench top, and moving arm A holding down a board. (f) Clamp

taneously; and *rasps* and *scrapers* for finishing off surfaces.

Metal-working Tools.—Even the wood-worker will find a few of these useful at times: *files*, for smoothing down edges of fittings and removing projecting points of screws or nails; a *drill-stock*, to hold twist drills for boring small holes in metal; a small *anvil*, for hammering on; and a *hacksaw*, which is often needed for cutting through nails or screws.

In conclusion: as a rule, second-rate tools, especially edge-tools, are of very little use to anyone. Since tools, when their use has been mastered, are an excellent investment as money-savers, the price asked for a tool of first-rate quality, bearing a good maker's name, should not be grudged.

For hints on the use of various tools *see* the articles on PLANES AND PLANING, SAWS AND THEIR USE, *and* WOODWORK, JOINTS IN.

TOOL SHARPENING. — Plane irons, chisels and gouges require occasional grinding and frequent sharpening. Grinding is done on a circular grindstone or emery wheel, with water as lubricant and cooling agent, to produce a uniform bevel of about 25 degrees. The stone or wheel should turn towards the edge of the tool, both to keep it flooded with water and to prevent the edge being burred.

Sharpening, that is, putting a fine cutting edge on the tool, consists in rubbing the tool on a fine-grained oilstone, or hone, at a rather larger angle, say 30 degrees. The stone should have no vein marks in it, but be of the same colour throughout. The best natural stones are Turkey and Arkansas, which give a very keen edge. Good "composition" stones also are much used.

The stone should be bought ready cased —sunk in a wooden block, with a cover to protect the projecting part. Wipe a stone clean before use, and lubricate it with olive, thin mineral, or paraffin oil, and replace the cover before putting it away.

The main difficulty that confronts the beginner when sharpening a plane iron or chisel is to make long strokes without altering the angle, so producing a rounded, instead of a flat, bevel. At first the strokes may be kept short, and the tool gradually advanced, so that a good proportion of the whole surface of the stone may do its fair share of the work. Using the central part only will soon wear a stone hollow.

The edge must be carefully watched and tested on a thin sliver of wood, such as a matchstick, till all parts of it cut cleanly. If what is called a "wire edge"—a tiny flap of metal—forms, the back of the tool should be pressed *quite* flat against the stone and rubbed a few times to remove this.

The final touch — often omitted by amateurs—is to "strop" the tool on a strap dressed with tallow and crocus powder till the edge is perfectly clean.

A *chisel* should be given a truly straight edge. The iron of a *plane* must be rounded off slightly towards the ends of the edge, in order that there may be no visible scoring of the wood.

For jack planes the rounding is considerably greater than for smoothing and trying planes. It is effected by moving the iron laterally as well as to and fro, so that the corners are brought alternately near an edge of the stone with the rest of the blade overhanging. The pressure and grinding effect are then concentrated for a moment on a small part of the edge.

Gouges are of two kinds: "firmer" gouges, with the bevel on the outside; and scribing gouges, which have the bevel on the inside. The first are sharpened like a chisel, except that the tool has to be rolled from side to side, to bring all parts of the edge into contact with the stone.

Paring gouges are sharpened with a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

special oilstone slip, which tapers from one edge to the other, and has rounded edges. The slip is held in the hand and the gouge rubbed up and down on the more suitable edge. The slip is also used for removing the wire edge from a firmer gouge.

Centre-bits need occasional sharpening to be able to do their work cleanly. The nicker, which severs the fibres round the circumference of the hole, must on no account be ground on its outside edge, which should be quite parallel to the centre line of the bit, or splay outwards a little. All filing and rubbing must be done from the inside edge. The tip not only tapers from the inside, but is given a slight upward slant in the cutting direction so that a fibre shall be severed gradually by a "drawing" cut.

The router is sharpened from the upper side only. If bevelled on its lower surface it would not be able to cut at all. A careful examination of a new centre-bit of good size will perhaps explain matters better than words can. The nicker should be sharpened only just sufficiently to produce a keen edge, as every sharpening shortens it a trifle; and when it is too short to cut ahead of the router the tool will become practically useless.

Truing Oilstones.—When an oilstone becomes hollow and uneven with use, it may be given a true surface again by rubbing it on a flat iron surface sprinkled over with emery powder and water; more emery and water are added as needed. Or it may be rubbed on a sheet of emery cloth fixed to a flat board.

WALLPAPER, HANGING SUCCESSFULLY.—Anyone who decides to acquire the by no means difficult art of hanging wallpapers is advised to begin modestly in a small room where a few mistakes may be overlooked, and to use a fairly stout paper with a "set" design—that is, one completed in every width. In "drop" designs the pattern occupies two or three widths, and only every other or every third piece, as the case may be, will be cut alike.

The Outfit is Simple.—The outfit required is simple enough: a table, at least as wide as the paper and rather more than half as long as the lengths to be hung; a good supply of flour paste, free from lumps and thin enough to spread freely; a paper-hanger's brush with which to apply the paste, a large pair of scissors; a small plumb-bob on a string; a clean, fairly stiff clothes-brush for smoothing the paper down on the wall; and a step-ladder or stool of suitable height.

A little alum added to the paste will prevent it turning sour.

English wallpapers are ordinarily 21 in. wide across the pattern, with a ½-in. margin on each side, and are sold in rolls containing 12 yards each. In measuring up, windows and doors may be disregarded and 20 per cent extra allowed for papering above windows, etc., and wastage. The calculation required is a matter of simple school arithmetic.

Papering the Wall.—If the walls to be papered are already distempered, the distemper must be moistened with warm water and scraped off with a straight piece of glass, and the wall well swept. Any cracks or holes are filled in with plaster of paris, and the surface is sandpapered smooth.

Then follows brushing the walls over with a solution of size. The object of doing this is to prevent the paper gripping the wall so quickly after it is applied that adjustment becomes difficult. When the size has dried the wall is ready for papering.

Should there already be paper on the wall, the safest course, even if the old paper has a fairly perfect surface, is to strip and start afresh from the bare wall. The paper is repeatedly moistened with warm water till it peels off easily, and the walls are then treated in the manner already described.

Butting and Lapping.—There are two possible ways of making the vertical joints between pieces. Both margins may be cut off, and the edges of pieces made to touch without overlapping, like the boards of a floor. The pieces are then said to be *butt*-jointed. To make neat joins in this way it is essential that the trimming be done very accurately—not at all a difficult matter if proper care be taken. In well-hung butt-jointed paper the seams are practically invisible.

In the alternative method—*lap*-jointing—only one margin is removed, and the other is covered by the trimmed edge of the piece next to it. There, again, care is needed when hanging, to avoid leaving any of the margins visible. When lap-jointing is used, and especially if the paper is at all thick, laps must be made *towards* the window. Otherwise the laps will cast noticeable shadows.

Supposing the window to be on the south side, papering might begin on each side of it and be worked in both directions. The pieces for the east wall will have their right-hand margins removed, and those for the west wall their left-hand margins. As regards the south wall, the lap may be in either direction.

Starting and Finishing.—Wherever it is decided to start, the first length hung must be quite vertical, and a guiding line is therefore made in pencil with the help of the plumb-bob. If the walls are all quite

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

perpendicular the other pieces will be vertical also; but if there is any doubt on the point the plumb-bob should be used as a check now and then, and any lack of perpendicularity corrected as more pieces are fixed.

Since the pattern is sure not to match at the finishing point, this should be in some inconspicuous place, as over a window, where the paper will be narrow, or in a dark corner of the room, or in one that will be concealed by a bookcase or other furniture.

Before a start is made with the hanging, a roll of paper should have the edges trimmed, and some lengths be cut off. The distance between skirting and cornice or picture rail is measured, a couple of inches extra are allowed at each end for trimmings, and the lengths are cut accordingly.

Pasting.—Half of a length of paper is drawn on to the table, which has been covered with newspapers stuck together, with the edge away from the operator near the farther edge of the table, and the farther part of it is pasted by strokes outwards from the centre towards that edge. The piece is then drawn towards the worker, till its near edge is just overlapping the table, and the rest of the half is pasted similarly. The brush must never be drawn on to the paper from beyond an edge.

The pasted part is then folded over and stuck lightly to itself, and the piece moved endways to bring the other half on to the table, but a trifle nearer the worker, so that it may not pick up paste from the newspaper. After pasting, the second end also is folded over to make handling easier.

Instead of newspaper, a cut piece turned, of course, face downwards, may be used to protect the table, while its predecessor is being pasted.

The extreme ends of a piece are better left unpasted, as they will not be used.

Placing the Paper.—Having mounted the step-ladder or stool, the worker releases the top loop of the piece and adjusts one edge to the starting line, the top of the piece overlapping the cornice. The point of the scissors is run in the angle between wall and cornice, to mark the paper, which is pulled away sufficiently to allow the waste to be cut off along the mark. The brush is now used to smooth the paper down, with strokes from the centre towards each edge. A slight bulge that appears here and there can be disregarded, as this will disappear as the paper dries and contracts.

The bottom half of the piece is now unlooped and adjusted, the skirting line is marked with the scissors, the waste at the bottom is removed, and the brushing down of the piece is completed.

When the second piece is attached, care must be taken to overlap or butt it very accurately.

Corners.—When there is less than a width's distance between the piece last fixed and a hollow corner, the next piece must be trimmed off so as only just to extend past the corner on to the next face. If it were carried far beyond it, the paper would be certain to pull away at the angle as it dried and it would be torn sooner or later.

When it is in position the succeeding piece must be trimmed to match, and be fixed with its matching edge in the corner. Projecting angles, such as those between the front and sides of a chimney breast, do not require the same precaution, as shrinkage will only pull the paper harder against the plaster.

The pattern is carried unbroken over the mantelpiece and doorway, being cut to fit any mouldings.

Any patching or filling up that may be required should be left to the end of the job. Should a part have been badly stained and need covering, tear the patch into an irregular shape, the edges of which the eye will not pick out so easily as those of a rectangular patch.

WALLS, DAMP.—Permanently damp walls are injurious to health, destructive to wallpaper or the distemper on them, and damaging to furniture and fittings near them. Temporary dampness usually affects wall decorations only.

The dampness in a newly-built house is probably due to the materials not having dried sufficiently, owing to construction having been accompanied by bad weather. The following has been recommended as a test which is reliable at least in dry weather:

Weigh out very carefully a quantity of fresh lime, and spread it in a large pan placed in the centre of the room to be tested. Keep all windows and doors closed. At the end of 24 hours weigh the lime again. If its weight has increased by more than 1 per cent, owing to absorption of moisture, the room is too damp for safe habitation.

Permanent dampness may be due to any one of several causes. If underburnt, over-porous bricks have been used, they allow rain and moisture to penetrate too far for wind and sun to dry them out again, and some moisture reaches the inside.

Bad mortar, which perishes quickly on the face of the joints, acts in the same way as a conductor of damp. The trouble is aggravated in the case of much-exposed walls facing the wet quarter, or heavily

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shaded by trees which keep sunlight away from them.

The only remedies are to have the walls sprayed over with a waterproofing liquid in warm weather, or covered with roughcast or a rendering of cement, or to have joints repointed with cement mortar.

Walls of outbuildings may be made practically impervious by a coating of hot tar laid on while the walls are warm in the sun, or at least dry on the surface.

If the walls of ground-floor rooms are damp, though those of upper floors do not give trouble, the cause may be that a damp-course has been omitted between ground level and the wall plate carrying the floor, or that the damp-course is not waterproof.

The cutting away of the brickwork a little at a time and inserting an effective damp-course is a very expensive operation. An improvement may result if the ground next the wall is covered with asphalt or concrete over a width of 3 or 4 feet, sloping down outwards to a gutter which will carry the water clear of the house into a drain.

Where a house is built on a slope it is important to prevent earth banking against the uphill side above the damp-course, as may easily happen if the ground there is cultivated. Surface water coming downhill should be intercepted and carried past the house as far away as possible.

Where rooms extend below ground level, there must be a damp-course below the floor, and another vertical one included in the brickwork to a level above the surface. Or the wall must be coated on the outside with ½ in. of asphalt from the damp-course upwards. Where there are cellars, this outside asphalting is essential to keeping them dry.

Temporary dampness is usually caused by leaking gutters or downpipes, or by creepers leading water from the roof down on to the walls. When the cause is removed the dampness will disappear.

A spell of heavy and continuous rain, accompanied by a driving wind, will sometimes make the wall most exposed to it damp, because the bricks have no chance of giving up their moisture to the atmosphere; but the wall need not be regarded as defective if it remains dry under normal conditions.

Treating Walls Inside. — Very little damp is sufficient to stain wallpapers and distemper. Before a wall which shows signs of damp is repapered or otherwise decorated, it should be brushed over with one of the waterproofing compositions sold by colourmen for inside work.

WATCHES, CARE OF. — Watches should, if possible, be kept at an even temperature. In the winter time special care should be taken to see that the temperatures to which a watch is exposed are not too low, as cold may make the mainspring snap.

To avoid, as much as possible, the lowering of the temperature of a watch, pocket and wrist watches should be kept under the pillow at night time, or, with a wrist watch, the owner may continue to wear it, if this causes no inconvenience or discomfort.

A watch should be wound to its fullest extent, and this should be done at the same hour each day. It is preferable to wind a watch when it is considered to be at its lowest temperature, for when the temperature rises the mainspring will expand slightly. If a watch is wound when it is at its highest temperature, should the temperature fall, it causes the mainspring to contract, and this may have disastrous effects.

To help keep a pocket watch clean, the watch pocket should be turned out and well brushed at intervals, to rid it of dust which might find its way into the watch. It is also a good plan if a chamois-leather case is made for the watch, as this again helps to keep out dust.

A valuable watch should always be sent for repairs or for cleaning to the firm which made it, for they know their own watch better than any chance repairer would do, and a much more satisfactory job is probable. Should there be any replacements necessary the maker is able to effect the replacement, whereas the chance repairer may have to improvise, and so probably cause inconvenience to the owner at a later date.

If a watch be taken near a large dynamo or electric motor, the steel parts of the escapement may become magnetized and cause bad timekeeping. A watch affected in this way can be demagnetized, but anyone who has to work near electrical apparatus should provide himself with a non-magnetizable watch, or discard his watch before approaching the apparatus.

WATER SUPPLY. — Assuming that water is drawn from a public supply, it is important to know the position of the stopcock for cutting off the house branch from the main, to have the necessary fork-ended T-iron for turning the cock, and to keep this iron in a place where it cannot be hidden.

If a burst occurs during a thaw after frost, only the prompt cutting off of the main supply may avert serious damage. There may be other occasions, such as cleaning service cistern or boiler, or the repair or replacement of taps, when the stopcock will be needed.

If a draincock is fitted on the main

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

branch, between the stopcock and the house, it will be possible to empty the pipe feeding the cistern to below ground level, and so prevent freezing up in frosty weather.

When water is laid on to a house, the pipes should be buried at least 3 ft., to be beyond the reach of frost, and if possible they should be carried up interior walls. If this cannot be done, they should be cased in and insulated, especially where they have to pass near a window or door.

The house service tank, if it has to be placed in the roof, should be accessible through a trapdoor large enough to pass another tank of the same size, when that in use needs renewal—as it will do sooner or later, if of galvanized iron. (A lead-lined wooden tank may be regarded as a permanency.)

If this provision is not made, fitting a new tank may entail cutting a hole in a ceiling or the roof. As the roof is the coldest part of a house, a tank there, and any pipes leading to it, should be well protected from cold, a precaution which in only too many cases is neglected, with uncomfortable results when a severely cold snap comes.

To make inspection of the tank easy, the rafters round about it should be boarded over, and a boarded path from the trap-door be provided. It will also be money well spent to fit an electric light near the tank, and so do away with the plumber's candle-ends.

It is very important that all overflow pipes from cisterns should be completely self-draining. A bent pipe is able to hold water which may seal it in frost.

Stopcocks on the pipes drawing from the service tank, for cutting off the water when taps have to be re-washered, are recommended.

If the service tank is in an upper room, the noise of the water entering it through the ballcock may be a nuisance to people in neighbouring rooms. Covering the tank in and making the ballcock discharge through a pipe reaching almost to the bottom of the tank will prevent the inflow causing annoyance.

WATER TAP, RE-WASHERING A LEAKY.—A tap leaks because the valve, when screwed down, does not make a watertight joint with the seat against which it presses.

The valve consists of a loose "jumper," to the underside of which a soft washer of fibre or rubber is attached by a nut. Use gradually cuts away the washer until the metal of the jumper comes into contact with the seat, and then dripping, which may develop into a steady flow, begins. What appears to be a trifling leak may waste many gallons of water in a day, and may keep the hot-water supply depleted. Leaking hot-water taps at least should therefore be attended to at once.

The first step is to provide oneself with a new washer. Measure the bore of the nozzle of the tap, and if it is ½ in. ask for a washer for a ½-in. tap. The next thing is to cut off the supply, if possible. The fresh-water tap is put out of action by merely turning off the supply from the main. In the case of a tap drawing from the service cistern in the roof, the inlet from the cistern may be closed with a wooden plug, which need not be a very good fit, as a small flow will not matter. In some houses there are cocks in the piping for isolating the cistern, and these make the job a matter of only a moment or two, but be careful to turn a closed cock on again after the tap has been put right.

If neither of these courses be feasible, the main cock may be closed and the service cistern emptied. If the hot water is drawn off from *above* its tank or cylinder, the hot water will not be disturbed; but if the draw-off is below the tank, the hot water as well will run away.

Finally, if the tap is not on the main, the operation of re-washering may be done with the water running (except very hot water), and splashing be prevented by covering the tap with a heavy cloth as soon as it has been opened. A tap on an upper floor will be relieved if a tap drawing from the same supply at a lower level is turned on full.

Now comes the removal of the cover, or collar, of the tap. This is effected by gripping its hexagonal neck in a spanner—which must be a good fit to avoid slipping and cutting the neck—and turning in an anti-clockwise direction. Especially if the tap is attached to a lead pipe, the pull of the spanner should be opposed by gripping the tap's nozzle.

Some bathroom taps have the spindle housed in a rounded cover, which has to be unscrewed and lifted up the spindle as far as it can go to expose the hexagon.

When the jumper has been removed, take off the nut holding on the old washer, fit the new washer, and replace the nut. Getting the new washer on may necessitate enlarging the hole in it with a broach or the tip of a triangular file. Should the washer project beyond the edge of the flat plate of the jumper, trim off the surplus with a sharp knife, being careful not to bevel the washer.

Before replacing the cover, screw the tap spindle up, as otherwise the valve may be hard down against the seat before the cover is home, and damage be done.

If a tap leaks badly round the spindle

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

when the water is turned on, this is a sign that the spindle needs repacking or that more packing should be added. To get at the packing, unscrew the milled-edge collar encircling the spindle. The packing can then be dug out and replaced by soft, untwisted twine, forced down after every few turns round the spindle.

WOODWORK, JOINTS IN.—Halved or halving joints in their various forms are much used in joinery for connecting two parts of the same thickness. The *cross halving* (Fig. 1*a*) gives the parts a firm grip on each other and prevents either moving.

In marking out, the gauge is set to half the depth of the pieces, which are marked on both sides, from the faces which are to be in the same plane when the pieces are assembled. If this precaution be taken, it will not matter should the gauge have been set a trifle incorrectly. The width of the notches should be such as to make each part fit tightly into the other, for if there be any looseness the joint will be wobbly.

The *stopped halving* (Fig. 1*b*) is used where there is no crossing and the end grain of one part is to be concealed. It comes in usefully for intermediate bars, as the tongue makes fixing with nails or screws easy.

The *corner* or *angle halving* (Fig. 1*c*) is a favourite with amateurs, as it offers the simplest method of joining two pieces at right angles. But the *angle bridle* or *open mortise* (Fig. 1*d*) is a stronger and more workmanlike joint, resisting twisting strains much better. The marking out is as for the through mortise and tenon (*see below*.)

The *plain housing* (Fig. 1*e*) is a square groove cut right across the grain of a surface (say, a side of a bookshelf) to take the end of a board. It affords excellent support, and the part let in can be firmly secured in the housing by screws.

To keep the cuts on each side of the housing to the same depth everywhere, the tenon saw should be "blinded" by two strips of wood screwed together beyond the ends of the blade, and set parallel to the edge at the requisite distance. The waste is chiselled out, working from both ends towards the centre; or, what is a much quicker process, removed in stages by a router. The fit should be tight. If the groove is too wide, the joint becomes unsightly.

Where the groove is not to be seen from one end, the *stopped housing* (Fig. 1*h*) is used. This is more troublesome to cut, as part of the inner end of the groove must be chiselled out before a saw can be employed.

This joint is a favourite one for bookshelves. Nailing or screwing may be avoided—and this applies equally to the plain housing—if tenons are formed on the end of the housed part, and mortises cut in the other part, and the tenons are wedged (*see* Fig. 2*q*).

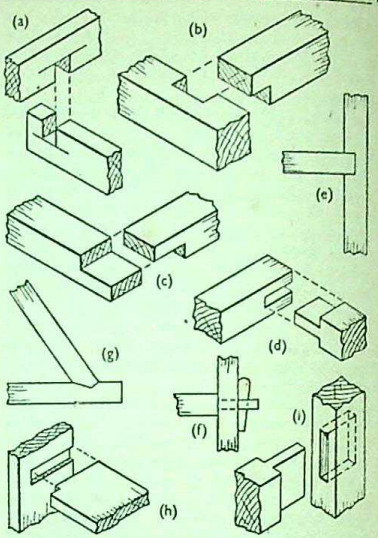


Fig. 1.—Joints in woodwork. (a) Cross halving. (b) Stopped halving. (c) Angle halving. (d) Angle bridle. (e) Plain housing. (f) Keyed tenon. (g) Sloping-toe joint. (h) Stopped housing. (i) Through mortise and tenon

The *sloping-toe joint* (Fig. 1*g*) is an excellent one for the end of a strut, and the right one to use on a ledge-and-brace door. It is also very suitable for raking members in heavy timberwork.

The end of the strut is bevelled off from the point at which it meets the other part, and the extreme end is cut square to the non-bevelled side. The two parts are nailed, screwed, or, in the case of heavy work, bolted together.

A common modification of this joint is the *bridle-toe joint*, in which the end of the strut is forked like one member of an angle bridle (Fig. 1*d*) to fit a rib left between two notches cut on either side of it. The rib makes it impossible for the strut to shift laterally.

The *wedged* or *keyed tenon* (Fig. 1*f*) is a very handy joint for bookshelves or other furniture which must be capable of being taken to pieces quickly for packing.

The hole in the tenon must have at least ¼ in. of wood between it and the end, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

extend a little way into the mortise, so that the key shall not be "gagged." The key must not be driven in hard, lest it should burst the end of the tenon.

The *through tenon and mortise* (Fig. 1*i*) is one of the most useful of all woodwork joints. It is named after the fact that the tenon or tongue formed on the one part goes right through the other part, in which a mortise or socket is cut to fit it. The length of the tenon gives it a very strong hold.

The sightliness of the joint depends on the sides of both tenon and mortise being quite parallel to the faces of the wood in which they are formed, so some hints on the proper procedure will be given. In the first place, a mortising gauge is almost essential to accurate work. This has two marking points, one of which can be set any required distance from the other by means of a screw.

On the working face—this will be that on which the end of the mortise will show—mark the positions of the ends of the mortise, which will be as far apart as the depth of the tenon piece. Square lines across through these, and from their ends square lines down the sides, and join the ends of these on the fourth face.

If the tenon is to be wedged, two lines are scored across the working face outside the other cross lines, as shown in Fig. 2*m*, since the mortise will require a splay towards the outside.

Next, set the two points of the mortise gauge as far apart as the width of the chisel which will be used for cutting. This should be a proper mortising chisel, by the way, about one-third as wide as the working face of the mortise piece. The stock of the gauge is then adjusted so that the two points are equidistant from the edges of the working face. The gauge is drawn along with the stock kept in contact with one side of the piece, the marks being carried beyond the cross lines both ways. The opposite face is marked similarly—remembering to use the *same* contact face as before. All then is ready for cutting.

The piece having been fixed *firmly* on the bench, working face upwards, the chisel is applied near the centre of the mortise, bevelled side towards the centre, and kept perfectly upright laterally while driven in a little way. It is then turned for a similar cut on the other side of the centre, which will remove a triangular chip.

The opening is lengthened both ways in alternate cuts, to a depth not much exceeding half the thickness of the wood, until a good opening is obtained, and then kept bevelled side towards the centre until the end marks are reached. Then the piece is turned over and cut through from the other side.

Note.—It is very bad practice to cut right through from one face. The chances are heavily against the direction being kept correct, and in favour of the wood being splintered by the chisel as it comes out.

If the tenon is to be wedged, the mortise ends are now extended on the slope to the wedge lines on the working face. A flat chisel may be needed to true up the sides of the mortise, which on no account should reach beyond the marks.

The chisel must not be allowed to undercut the ends of the mortise, and shape them into shallow Vs, especially if wedges are to be used, since their effect would be thereby much reduced.

Where mortises are long, a good deal of time can be saved in cutting if holes are first bored into the wood from both sides with a bit of rather smaller diameter than the width. In any case a hole through the

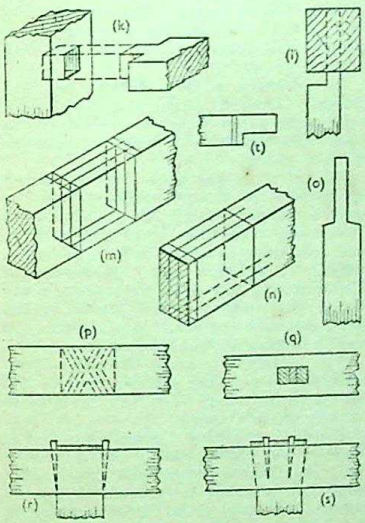


Fig. 2.—Joints in woodwork. (k) Stopped tenon. (l) Bare-faced tenon. (m) How a piece is marked out for a mortise. (n) Piece marked for tenon. (o) Tenon with badly cut shoulders. (p) Direction of chisel cuts for a mortise. (q) Centre wedging. (r) Tenon wedged outside. (s) Tenon spread by wedges. (t) Square-haunched tenon

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

centre will expedite matters, notably when a square mortise has to be cut.

A tenon is marked out as shown in Fig. 2*n*. It will be noticed that the wood extends a little beyond the part needed for the tenon. This is to allow for chamfering off the end so that it may enter the mortise more easily, and to ensure a clean finish after the tenon is fixed, when the waste is chiselled and planed down flush with the mortise piece.

The same gauge-setting should be used for mortises and tenons, and the latter be marked from the surface, which will be in the same plane as the guiding surface used for marking the mortises. Then, if the mortise be a bit out of centre, the tenon will be the same, and the parts will lie flush.

The tenon piece, after being marked out in the same way as the mortise piece, is held upright in the vice while the saw is run down as close to the marks as is possible without cutting them out, until it just reaches the shoulder lines on both sides. The shoulders must be cut perfectly square across. If they slope outwards, as in Fig. 2*o*, there will be unsightly gaps between them and the mortise piece. Slight under-cutting is not objectionable, as it ensures the shoulders making contact with the mortise piece.

A tenon should not press very hard, when driven, upon the sides of its mortise, if these are thin, lest the wood should be split.

The *stopped tenon*, fitting a mortise not carried right through the wood, is illustrated by Fig. 2*k*. A neat way of securing the tenon is to give the mortise a dovetail form in the direction of the grain. The tenon is then slit to take two wedges, which, when the tenon is driven home, expand it into dovetail form.

The *bare-faced tenon* (Fig. 2*l*) is used where the tenon piece has to be thinner than the mortise piece, to save weight, or to give room on one side for boarding.

The *square-haunched tenon* (Fig. 2*t*) is much used at corners, where the wood must be weakened as little as possible. The haunch increases the resistance of the tenon piece to twisting strains, and at the same time fills in a groove if one has been made in the mortise piece to take the edge of a panel. Where there is no groove the haunch may be sloped off from the shoulders to the tenon.

Wedges should always lie across the grain of the part which will have to withstand their force. In Fig. 2*q*, the centre part of the cross-shaded area is the wedge. Fig. 2*r* illustrates outside wedging; Fig. 2*s*, inside wedging with two wedges. The wedges, as well as the parts to be joined, are glued, and left till the glue has set before being cut off level.

To prevent the mortise pieces being burst by wedges driven in tenons near their extremities, it is advisable to allow a little waste length of wood at each end. This is removed after the glue has set.

WOODWORK, POLISHING. — The simplest method of polishing wood of any kind, whether it is stained or not, is to rub it over with beeswax dissolved in turpentine to the consistency of soft butter.

The wax is shredded into a jar, and covered with turpentine. The jar is then heated by standing it in hot water or on a hot plate (it must be kept well away from a naked flame) till the wax is quite melted. The polish is then put aside to cool. If too thin or too thick, it must be reheated and more wax or turpentine be added, as the case may need.

The polish is rubbed in hard with a soft rag and afterwards polished with a clean cloth. In fact, the procedure is the same as that of polishing walking shoes.

If water falls on a wax-polished surface it leaves marks, but these are effectively removed by a further application of the polish. The wax may, however, be set, that is, made resistant by brushing it over gently with french polish, thinned with methylated spirit.

Oil polishing is very effective for hard woods. Linseed oil is simmered (not boiled) for a few minutes and allowed to cool. One-eighth of its bulk of turpentine is then added.

The oil is applied with a pad of several thicknesses of flannel wrapped round a cork or wooden block. The oil sinks into the grain, even after many applications, and obtaining a good dull polish is a matter of patience and "elbow-grease." Rubbing may have to be repeated for many days. But when at last the wood has been saturated the effect on oak, mahogany and American walnut is very fine.

The surface is water-resisting, but oil-polishing is not very suitable for the tops of tables on which linen will be laid, as it may cause staining.

French polishing gives unequalled results, but unfortunately the process is very complicated and tedious, and a great deal of practice is needed to ensure success. It may therefore be regarded as beyond the capacity of the amateur who is not prepared to take it very seriously.

It may, however, be mentioned that french-polished work which has become dull can be "renewed" by being cleaned with warm soda water, wiped quite dry, and rubbed over with a mixture of 4 parts of french polish to 1 part of linseed oil. This is applied on a rag wrapped round a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

little wadding to form a soft pad. If the pad works stickily, a little more oil should be added to the mixture.

WOODWORK, SCREWS AND SCREWING IN.—Screws should always be used for holding together the parts of highly-finished woodwork which may possibly have to be separated at some future time. They have much greater holding-power than nails of equal length and thickness. Countersunk-headed screws, which enter flush with the surface of the work, are most commonly used; round-headed screws, which stand out above the surface, are employed in special cases, such as fixing rim locks on doors.

The lengths of the different stock sizes of wood-screws are: ¼ in., ⅜ in., ½ in., ⅝ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., 2 in., 2¼ in., 2½ in., 3 in., 3½ in., 4 in., 5 in., 5½ in. and 6 in., and every length is obtainable in over a dozen gauges or thicknesses. It saves money to buy the smaller sizes, or any size of which many are used—such as 1½ in., 1¾ in. and 2 in.—by the gross.

It saves time and trouble to keep the sizes in separate containers—old teacups or small jam-jars, for example—and to carry these in a special box, provided with a handle. There will then be less running to and fro in search of screws of the right size for the job in hand.

Use screws of stout gauge where they must be short, but have to stand a considerable strain; and long screws where these have to enter the holding part along the grain.

Wherever appearance is of importance and the heads will show, use brass screws, though they are considerably more expensive than iron screws.

Screwdrivers.—At least three screwdrivers should be kept, one for large, one for medium and one for small screws. If its point is wider than the head of the screw, a screwdriver will damage the wood round the head as the screw goes home. On the other hand, trying to force in a large screw with a small screwdriver may break the latter or cut the slot in the screw.

A square-shanked driver to fit a brace is very useful in cases where a number of large screws have to be driven, as a big leverage is obtained. For small screws the Archimedean driver is convenient, and in many cases the ratchet screwdriver makes work easier.

The tip of the screwdriver should have a square, blunt end, thin enough to enter the smallest screw for which it would be used. A point which tapers very quickly towards the end is likely to slip and cut the edges of the slot.

For deep holes a round-shanked driver is needed. A screw-wrench applied to a flat-shanked driver is useful for moving a stubborn screw.

Boring Holes for Screws. — Driving screws is made easier by preparing the way for them with a bradawl, gimlet or drill. In all cases a starting hole should be made, to allow the screw to get a good grip, which will enable it to penetrate soft wood on its own account.

Where one piece of wood has to be held to another, the held part should be bored right through, the hole—in hard wood at least—being as large as the unthreaded part of the neck. And in hard woods, again, a smaller hole should be drilled to the full depth of the screw into the holding part.

A drill, not a gimlet, should be used for boring holes for large screws near edges, where a gimlet is likely to cause splitting.

Room for the conical head of a screw is made with a little tool called a countersink, sold for the purpose and used in a brace or drill-stock. To give a neat appearance, the nick must not go deep enough to allow the head to sink below the surface, unless it is desired to putty the head over, in which case a deep nick is needed.

Driving Screws.—Keep a tin of vaseline handy, and dip the points of large screws in it before driving. They will then enter more easily, and will come out again easily at any future time, as the grease will prevent rusting.

If a screw enters unwillingly, do not force it, lest the slot should be cut. Extract it and deepen the hole.

Keep the shank of the driver in line with the screw. If it tilts, the tip will probably slip and damage the slot.

Where a number of screws have been driven—into a chest lid, for instance—go round them a second time to take up any slack caused by the wood having been compressed.

If it is difficult to get parts to meet, give the held part smart blows with a mallet while using the driver.

Loosening Stubborn Screws. — Apply paraffin or lubricating oil and let it work in. Or apply a screwdriver and hit the end with a mallet, to drive the screw in a tiny fraction of an inch farther. Or apply a red-hot iron to the head, to expand the metal of the screw.

WOODWORK, STAINING. — The staining of floors can be done with a solution of permanganate of potash dissolved in water. The solution, though purple, produces a brown stain. The stronger the solution, the deeper will be the shade.

Test on an odd piece of wood, and get the shade right by adding more water or permanganate, as the case may be. This

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stain dries dull, and must be followed by varnishing or beeswaxing. Before applying varnish, give the wood a coat of size, or rub it over with linseed oil, to check absorption.

Where black is not objected to, the surrounds of floors may be sized and then painted over with japan black, thinned with turpentine. The japan dries with a more or less glossy surface, and does not require varnishing.

When finished woodwork, such as that of cabinets and furniture, is in question, the wood must be carefully prepared by scraping or sandpapering, as on this depends largely the success of staining.

Nail-holes and dents or depressions must be filled in with a stopping of plaster of paris and whiting, allowed to set hard and then rubbed down smooth. To prevent any end-grain surfaces appearing much darker than the side-grain, they should be rendered less absorbent by applying oil or size. Local treatment may also be needed on and round knots showing in the side-grain.

Classes of Stains.—Wood stains may be divided into (*a*) *water stains*, mixtures of dyes or pigments with water; (*b*) *spirit stains*, having the colouring matter dissolved in turpentine or alcohol; (*c*) *oil stains*, in which the pigments are mixed with linseed oil and turpentine; and (*d*) *chemical stains*, which change the colour of wood by chemical action.

Water Stains are very popular—being transparent and allowing the grain of the wood to be displayed—and cheap. The colours, ready for mixing with water, can be purchased at an oil shop. They roughen the surface of the wood, however, unless precautions are taken beforehand as follows: Damp the wood all over; the uneven swelling of the fibres roughens the wood, which, when quite dry, is rubbed smooth with fine glasspaper. The process may well be repeated to make certain that the grain will not "come up" when the water stain is applied.

The pores of the wood are then plugged by rubbing in a mixture of plaster of paris, whiting and water, smoothed down with fine sandpaper used along the grain. End-grain surfaces should be well sized.

When applying the stain, keep the brush well charged and do not retouch a surface that is partly dry. Wipe off any surplus quickly with a dry rag. If the shade is not dark enough, a second coat can be applied, or light patches dealt with locally. As a general rule it is safer to reach the desired shade in two or three stages with a weak stain than to depend on a single coating of strong stain.

When the stain is thoroughly dry, rub down with brown paper, size the wood, allow it to dry, and apply a second size coat. Then rub down and leave the work to dry a few days before varnishing. Any moisture left in the wood will make varnish turn cloudy.

Spirit Stains are much more expensive than water stains, and therefore more suitable for high-class work. They do not bring up the grain and are more easily controlled than water stains, as they do not penetrate the wood so quickly.

Oil Stains also do not bring up the grain. They are better than water stains on rough and porous wood, being less penetrating. The higher the proportion of oil to turpentine the smaller will the soakage be.

Chemical Stains.—A solution of bichromate of potash is very useful for darkening oak and mahogany. Pyrogallic acid (1 part to 30 parts water) stains white woods grey; and the same colour is produced in oak by a 2 per cent solution of sulphate of iron.

Fumigating Oak.—Oak can be darkened permanently by exposing it to the fumes of ammonia gas. Small articles made of the wood may be enclosed in a large box with well-fitting lid, along with saucers into which "liquid ammonia"—the gas dissolved in water—has been poured. The joint between box and lid should be made as airtight as possible by pasting paper along it.

The gas will soon fill the box. At the end of six hours the articles may be examined, and if not of the desired shade, fresh ammonia should be added and the box sealed up again. As soon as the requisite shade is attained, the wood should at once be rubbed over with linseed oil, to prevent the gas leaving the wood.

Should the fumigation have gone too far, however, oiling should be deferred until some has escaped and the shade lightened sufficiently. After the oil has dried, polish with wax polish (*see* WOODWORK, POLISHING).

General Hints.—Before use, test stains on pieces of wood similar to that to be stained. Allow the test stain two or three days to show its true colour, as some stains fade as they sink in.

Non-pigment stains should be rubbed over with a dry cloth immediately after brushing in. Pigment stains may be lightened, if too strong, by rubbing dark places while the stain is wet.

A scent spray is handy for applying water stains and spirit stains very evenly.

WOODWORK, VARNISHING. — The object of varnishing woodwork, whether painted or not, is to give it a glossy, hard surface to which dust will not cling, and which therefore is easily cleaned, and to exclude damp. Being transparent, it does not conceal what it is laid over.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The varnishes most commonly used for woodwork are called *oil varnishes*, because they are composed of resins—copal, shellac, kauri, etc.—dissolved in oil, usually linseed oil. They harden slowly, since the oil takes a long time to combine with oxygen, but when hard provide a tough and durable covering.

Oil varnishes fall into two classes: "outside" varnishes, which will stand exposure to the weather; and softer "inside" varnishes, which are suitable for indoor use only. Outside varnish is used indoors as well as out, and the finest kinds of varnish, such as pale carriage varnish, belong to the "outside" category.

Cheap varnishes are, as a rule, a very poor investment. Many of them will not harden properly, and in damp weather turn white and cloudy.

Spirit Varnishes, which here need only just be referred to, are resins dissolved in alcohol, turpentine, or other volatile oils. As they dry very quickly they are difficult to apply evenly and may be very brittle when hard.

Oil varnishes improve with age, provided that they be stored in airtight containers. Varnish kept in an imperfectly stoppered can will turn thick and be useless for good work. Since high-class varnishes are expensive, the corks protecting them from air should be beyond reproach. It is a good move to dip their heads into melted paraffin wax to seal the pores.

Three don'ts: Don't add anything to varnish as long as it is in good condition. Don't pour varnish that remains over after completing a job back into the unused varnish; store it in another can and use it for rough work. Don't pour varnish into any but absolutely clean vessels.

If varnish becomes too thick for use, it should be warmed in a pan of hot water and thinned by the addition of fresh varnish (also warmed) and some turpentine. On no account should the mixing be done cold.

Surfaces for Varnishing.—Varnish tends to show up any imperfections in surfaces to which it is applied. Any number of coats will not conceal roughness in the wood below. If varnish is to be laid on bare wood the wood should be made as smooth as is possible with the scraper and fine glasspaper and have its pores closed by rubbing it over with a wood-filler.

Painted work also requires careful smoothing. Where varnishing is intended, the last paint coat should be "flat," since varnish works badly on glossy paint. The paint must be *thoroughly dry* before being varnished, as otherwise it is likely to crack or make the varnish cloudy.

Brushes.—The success of varnishing depends in no small degree on good brushes being used. It is impossible to do good work with a bad brush. Even an expensive brush may prove a failure. So if, after a fair amount of use, a brush is found to be entirely free from loose hairs —which ruin a surface if left adhering— and to produce clean work, it should be treasured and treated with great respect.

When not in use it should be *suspended* in an airtight vessel with its tip only just touching a mixture of alcohol and turpentine. Some authorities recommend that it should be hung clear, and depend on the vapours for keeping it soft. A simple method of suspension is to pass the handle through a hole in the centre of the cork used as a stopper.

The worst thing that can happen to the brush is to be left standing on its bristles, which turn up under the weight and, if left bent long, will refuse to straighten again.

Applying Varnish.—Cold, damp and dust are foes to varnishing. The first two make varnish whiten, a defect which can be remedied only by removing the varnish and beginning again.

Dust sticks to wet varnish and may ruin the appearance of the work. Varnishing should, therefore, not be done in a low temperature or dirty surroundings. A room suitable for the work would have a temperature of at least 60°, and have been carefully dusted beforehand, wet tea-leaves or sawdust being used on the floor. Windows and doors would be kept shut, to prevent draughts and the entry of flying particles.

In applying varnish, one must not try to cover the surface too quickly. A little at a time, and frequent recharging of the brush are good rules.

If the varnish is applied too thinly, it will not dry with a good gloss; and if too thickly, it will run into ridges. Like paint, varnish should be stroked off along the grain, but it will tend to lather if brushed too much. The air bubbles form, break, and leave tiny but unsightly craters in the dried varnish.

A coat should be given at least a week to dry in before another is laid over it. It is essential that it should have lost all stickiness to the touch.

The varnish, when ready, should be rubbed with very fine pumice powder applied on a wetted felt pad, till the surface is quite smooth, wiped quite clean with a sponge and allowed to dry for a day. The rubbing down destroys the gloss, but the next coat will restore it. Subsequent coats, except the last, are treated in the same manner. For ordinary work, two coats are sufficient.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ENCYCLOPAEDIA OF GENERAL KNOWLEDGE

Essential Facts on all Significant Subjects Clearly Stated and Exactly Defined

ABATTOIR, a public slaughter-house, under the control of the local government authorities and provided with the proper equipment for dressing and cooling meat and disposing of offal.

ABBEY, a religious institution inhabited by monks or nuns, and ruled by an abbot, or abbess. The term covers the church, round which the life of the community centred, the chapter-house, dining-hall, dormitories, schools, outside offices and farm buildings. After the suppression of the monasteries by Henry VIII many English abbeys became ruins—for example, Glastonbury, Melrose and Tintern—and some disappeared entirely; but fortunately the churches of many have been preserved and are still in use—those of Westminster and Tewkesbury among them—though the original buildings adjoining the abbeys have been destroyed.

ABDICATION of a throne is the surrender by a sovereign of his rights as ruler. In English history Richard II (1399), James II (1688) and Edward VIII (1936) abdicated. In 1918 the German and Austrian Emperors both abdicated, as did King Carol II of Rumania in 1940 and King Vittorio Emanuele III of Italy in 1944.

ABIOGENESIS is a term signifying the production of living from non-living matter. No definite instance of abiogenesis has yet been proved, and its possibility is still a matter of speculation.

ABORIGINES are the races found to be inhabiting countries when first discovered by Europeans. The Red Indians are the aborigines of North America; the Hottentots and Bushmen those of South Africa, and the Maoris those of New Zealand.

ABSINTHE is a very potent alcoholic liquor containing certain essential oils, including oil of wormwood. At one time it was made and drunk in large quantities in France, with disastrous results to those who indulged to excess; similar drinks are found in Greece and the Middle East.

ABSOLUTE TEMPERATURE is temperature reckoned from absolute zero, or point of no heat at all, which is −273° Centigrade or −459.4° Fahrenheit.

ACADEMY, an institution to promote learning, literature or art. The word is derived from Academeia, a pleasure-garden near Athens, in which Plato and his followers taught. Every highly civilized country now has its academies. (*See* ROYAL ACADEMY OF ARTS.)

ACETYLENE is a strong-smelling and poisonous gas, a combination of carbon and hydrogen, produced by the action of water on calcium carbide. It burns with a very white flame, and so is useful in bicycle lamps, flares for working by at night, and lighting buoys, and for household lighting. Mixed with oxygen it develops intense heat when burned. Oxy-acetylene jets are now widely used for cutting and welding metal.

ACHATES, the faithful friend and follower of Aeneas. (*See* AENEAS.)

ACHERON, one of the five rivers of the lower world in Greek mythology.

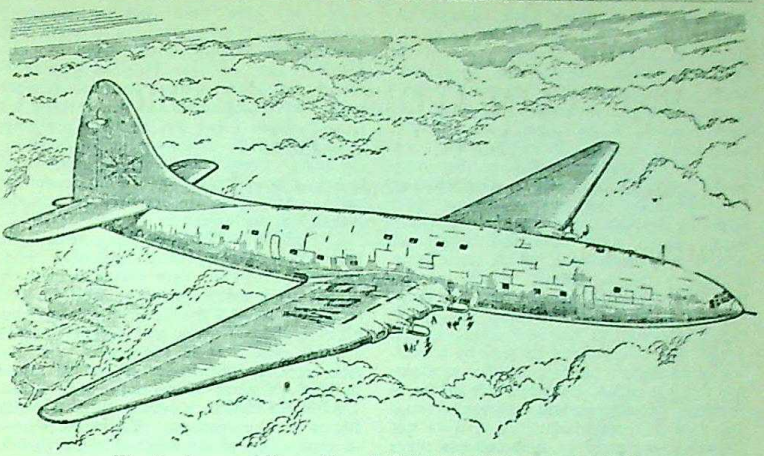
ACHILLES, in mythology, son of Peleus and Thetis, and one of the leaders of the Greeks against Troy. His mother dipped him in the river Styx to render him invulnerable, but the heel by which she held him was not wetted, and he died of a wound in that heel from an arrow shot by the Trojan, Paris.

ACIDS are a class of chemical substances which are able to turn litmus from blue to red, and in most cases have a sour taste. They all contain hydrogen, combined with one or more other elements; and the hydrogen may be replaced by a metal to form a salt. Thus, if zinc be added to sulphuric acid, the zinc will replace the hydrogen and zinc sulphate be formed. Sulphuric, nitric and hydrochloric acids are all exceedingly corrosive, and are often called the mineral acids. Citric, tartaric and acetic acids are used in the preparation of food and drinks. Carbolic acid is a valuable disinfectant.

ACOUSTICS is the science of sound. It deals with the pitch of notes to which the ear is sensitive, ranging from about 16 to 20,000 or more vibrations per second in the case of different persons; and covers the designing of musical instruments in a manner which shall give sounds pleasant

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



The Brabazon airliner, biggest British landplane so far built

to hear, and examination of the effects which the proportioning and shaping of large chambers, such as churches and concert halls, have on audibility.

ACT OF PARLIAMENT, a measure which, having passed through the Houses of Parliament after due discussion, and received the Royal Assent, has become law. It may be a public Act, affecting the whole community; or a private Act, applying only to a district, municipality, group of persons, or even a single individual.

ADONIS, a beautiful youth, so deeply beloved by Aphrodite that, after his death by wounds from a wild boar, Pluto allowed him to spend half of each year on earth.

ADVENT is the season preceding Christmas, during which the coming (Latin, *adventus*) of Christ is commemorated. It opens the ecclesiastical year, and begins on the Sunday nearest to November 30 (St. Andrew's Day). According to whether this Sunday precedes or follows that date there are five or four Sundays in Advent.

ADVOCATUS DIABOLI, or devil's advocate, is the name given to the person appointed by the authorities of the Roman Catholic Church to oppose the claims of a person to be canonized, or added to the list of saints in the calendar.

ADVOWSON is the right to present a clergyman to a benefice or living when it falls vacant. Some advowsons belong to the crown, others to the universities, bishops and others holding high offices in the Church, but a number of them are still in the hands of private persons.

AENEAS, son of Anchises and Aphrodite, was, next to Hector, the chief of the Trojans. His escape from Troy, long wanderings, and arrival in Italy, where he founded Alba Longa, form the subject of Virgil's "Aeneid." From him was descended Romulus, the founder of legendary Rome.

AERATED WATERS are beverages charged with carbonic acid gas under high pressure, which gives them an effervescing character when released from their containers. Some include mineral salts and flavourings, but the most popular, the so-called soda water, is simply plain water thus charged.

AEROLITES, or METEORITES, are masses of stone or metallic ore which pass through our atmosphere from space, and in a comparatively few instances strike the earth. Specimens found range in weight from a few ounces to several tons, and usually have a smooth, glazed exterior. Meteors and shooting stars are aerolites heated to incandescence and consumed by the friction of the air. The largest meteor of modern times fell in Siberia in June, 1908. It was destroyed by the impact, which produced a shock registered in England, was heard hundreds of miles away, and destroyed all the forests within a radius of over 30 miles.

AEROPLANES. — The aeroplane, a mechanically driven heavier-than-air craft with fixed planes or wings, first became a practical means of air travel in 1903, when the Wright brothers made some short flights with a machine of this type in N.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Carolina, U.S.A. Since then, though its original general principles have been retained, it has been greatly modified in details of design, and its size, speed and power much increased. As regards arrangement of wings, aeroplanes fall into two main classes: *monoplanes*, with a single pair; and *biplanes*, with two superimposed pairs. From another standpoint they may be divided into: *land planes*, with wheeled undercarriages, for starting from and alighting on land; *seaplanes and flying boats*, which start from and alight on water; and *amphibians*, which have floats or boat hulls and wheels which can be let down to enable them to run over land. Lateral balance is maintained by flaps, called ailerons, on the rear edges of the wings, and longitudinal balance by a horizontal rudder at the stern; while for steering to right or left a vertical tail rudder is provided. During certain manœuvres these are used in combination. A tail is not essential, as proved by such tail-less types as the U.S. "Flying Bats."

Ordinarily the airscrew is in front of the plane and pulls the machine through the air. Large aeroplanes have from two to eight engines and airscrews, to distribute the power and lessen the risk of forced descents, and for other reasons.

The aeroplane underwent immense development and became of outstanding importance during the Second World War. Whereas only 1,830 planes were built in the United Kingdom in 1936, 15,049 were produced in 1940, the year in which the German Luftwaffe was thwarted in the Battle of Britain (August-October). On the other hand, the Japanese Air Force undoubtedly played a leading part in the conquest of Malaya, the Dutch East Indies and other possessions of the Allies in the Pacific. Admiral Sir Andrew Cunningham stated that "an indispensable ingredient of sea power in modern war is the air." The help of the Allied Air Forces in the reduction of Germany by the destruction of communications and of industrial centres reached the peak in 1945, as did their support of the armies in the field. In a given 36 hours, for example, from 12,000 to 13,000 planes visited the Reich, dropping many 4,000- and 8,000-lb. bombs and some 730,000 incendiaries. Bombs weighing 12,000 lb. were used on occasion, notably on Heligoland in 1945.

Among the aircraft used by the Allies in various theatres of war were Super-Fortresses, Fortresses, Liberators, Halifaxes, Lancasters, Typhoons, Spitfires and Lightnings. Both sides also employed jet-propelled aeroplanes, Britain's twin-propulsion unit being known as the Meteor. Pilotless aeroplanes loaded with explosives were used against southern England in 1944. While a number did considerable damage, many were brought down in the air over the sea and open country by fighter planes and anti-aircraft guns. Development of the gas turbine for aircraft made great strides after the war.

AFFIDAVIT, a statement in writing, the truth of which is sworn to or affirmed before a magistrate or commissioner for oaths. Affidavits are required to support claims and as evidence.

AFFORESTATION, the systematic planting of large areas of land with trees. Between 1914-1918 over 450,000 acres of timber were felled in Great Britain, but from 1919 to 1939 the Forestry Commission planted 466,000 acres and private owners 160,000 acres. It is anticipated that the total area devoted to forest will be raised to 3,000,000 acres within the next 50 years.

AFRIKANDER, a person born in South Africa of white parents. The word is used in most cases of the South African Dutch, or Boers.

AGAMEMNON, commander-in-chief of the Greeks in the Trojan War, and King of Mycenæ in Greece. On his return home from Troy, he was murdered by his wife Clytæmnestra.

AGATE, a semi-precious stone of a more or less transparent character, and very hard, which is sometimes beautifully marked by bands of various colours. It is a form of silica, usually found as rounded lumps in the hollows of igneous rocks, wherein it has been deposited by the action of water. Agate is used for jewellery, and for parts of weighing-machines, clocks and scientific instruments.

AGAVE, a genus of plants with long spiky leaves, to which the American century plant belongs. Some varieties of this plant can attain a height of over 20 feet.

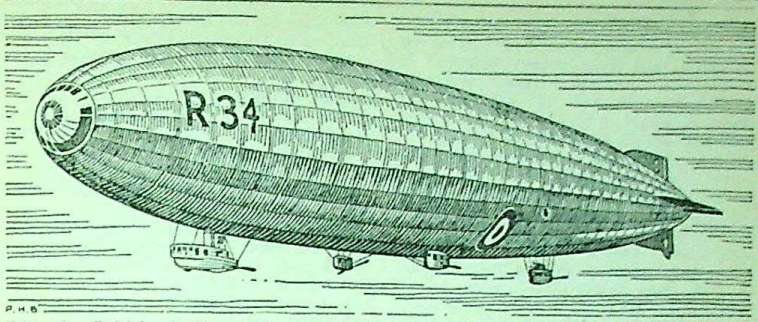
AGNOSTICISM, a word coined by T. H. Huxley (1825-95), indicates a state of mind which, while not denying the existence of a Supreme Being, refuses to believe in what cannot be definitely proved by the evidence of the senses and science. It must not be confused with atheism, which denies the existence of God.

AGONY COLUMN is the title given to the section of a daily newspaper which is devoted to advertisements of a personal or secret nature, some of which—such as those concerning missing relatives and friends—betray distress on the part of the advertiser. Hence the name.

AIR is the mixture of gases surrounding the earth as an envelope, which is called the atmosphere. Its two chief constituents are nitrogen (nearly four-fifths of the whole) and oxygen (just over one-fifth). About one part in 100 is made up of water

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



R34, the British airship which was the first lighter-than-air craft to fly the Atlantic. She made the round trip, Scotland—New York—England, in 1919, without mishap

vapour, carbonic acid gas, and the rare gases argon, neon, helium, krypton and xenon which are present in minute quantities. In the neighbourhood of towns especially, it contains soot and other impurities which tend to weaken sunlight.

Air is essential to animal life, as the oxygen in it is needed to purify the blood and produce certain chemical changes in the body. Fishes extract air from water by means of their gills.

At sea level air weighs about one ounce per cubic foot, and exerts a pressure of about 14¾ lb. per square inch on whatever it touches. It would be liquid at a temperature of −328° F. (*See* ATMOSPHERE.)

AIR-GUN is a weapon for projecting lead pellets or darts by the sudden expansion of compressed air. At the back end of the barrel is a cylinder containing a piston, which, when the trigger is pulled, is released and pushed forward by a previously compressed powerful spring, and compresses the air in front of it sufficiently to eject the pellet, etc., with considerable force.

AIR-PUMPS are pumps designed for altering the density of the air in an enclosed space. One class, of which the tyre-inflator is an example, is used to increase density and pressure. Pumps of the other class remove air and produce a more or less complete vacuum.

AIR RAIDS.—From 1939 until May, 1945, the total of civilian deaths caused by air raids during the Second World War amounted to 60,595 in all. 86,182 people sustained serious injuries. Damage to property was estimated at £1,000,000,000. These figures, of course, relate to Great Britain only. Other countries, inevitably Germany and Japan, suffered on a still bigger scale in the closing stages of the war.

AIRSHIP.—The first airship, that is, mechanically propelled steerable balloon, was constructed by the French engineer, Henri Giffard, in 1852. The envelope was spindle-shaped, widening from a point at the bows towards the centre, and tapering off again to the tail. This general form, modified as the result of experiments, has been retained in later airships. The first really successful non-rigid airships—those in which the shape of the envelope is preserved by the pressure of gas inside—were those of Santos Dumont, a young Brazilian, who built a series in France in the years 1898-1902. During the same period Count Ferdinand von Zeppelin constructed the first successful rigid airships, having a hull of light, strong lattice work covered outside with fabric and divided internally into a number of compartments, each containing a gasbag. French, Italian and German engineers produced a third type, the semi-rigid airship, which had a collapsible gas envelope like that of a non-rigid, but was stiffened on the under side by a metal girder or keel from which the cabin and engines were suspended. The British Government abandoned airship building after the destruction of the *R101*, a ship holding 5,000,000 cubic feet of gas, in France on October 5, 1930. A smaller airship, the German *Graf Zeppelin*, was proved a success, and besides encircling the globe, made many trips with passengers across the Atlantic. The development of the aeroplane in the Second World War makes the reappearance of the airship unlikely. In still air, rigid airships are able to attain speeds of up to 70 m.p.h. Despite the burning of the *Hindenburg* in 1937, Germany announced that she would continue to build them, though it was significant that the *Graf Zeppelin* made no more trips.

AJAX, son of Telamon, was one of the Greek leaders in the Trojan war. He went mad and killed himself when the armour of Achilles was given to Odysseus.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ALABASTER is a dense form of gypsum, or sulphate of calcium. The best alabaster comes from Tuscany, in Italy. It is pure white in colour, and soft enough to be carved easily into statues, vases and other ornaments.

ALBATROSS, the largest of sea birds, is allied to the petrels and gulls. The wandering Albatross (*Diomedea exulans*) has normally a wing-spread of 11½ feet, and is met with many hundreds of miles from the nearest land.

ALBERT HALL, ROYAL, in Kensington Gore, London, was built in 1867-1871 as a memorial to the Prince Consort. It holds about 10,000 people, and is the chief centre in London for important musical performances, political demonstrations and other large meetings.

ALBERT MEMORIAL, Kensington Gardens, London, opposite the Albert Hall, was erected in memory of the Prince Consort. Designed by Sir Gilbert Scott, it was completed in 1872 at a cost of £120,000. The pedestal is sculptured with the portraits in relief of 178 great artists of all times. It was slightly damaged by air attack in the Second World War.

ALBIGENSES, a religious sect which appeared in the south of France at the end of the 12th century. The Pope proclaimed a crusade against them as heretics, and they were exterminated without mercy.

ALBINO, a person with unnaturally white skin and hair, and pink eyes. White rabbits and elephants, white blackbirds and crows are examples of albinism in quadrupeds and birds respectively.

ALBUMEN, an almost transparent nitrogenous substance found in animal and vegetable tissues. White of egg is practically pure albumen. Albumen is coagulated by heat, acids and alcohol.

ALCHEMY, the art which preceded and was developed into modern chemistry, was concerned chiefly with the search after methods of converting lead and other base metals into gold, and after magic elixirs or liquids which would cure all diseases and endow people with perpetual youth. Among famous alchemists, that is, professors of alchemy, were Roger Bacon (1214-1294), the English monk, and Paracelsus (1493-1541), a Swiss physician.

ALCOHOL is a liquid compound of hydrogen, oxygen and carbon. It may be produced artificially, but is derived chiefly from the fermentation of sugary liquids, obtained from grapes and other fruit, grain, potatoes and sugar cane or beet juice. Absolute, or quite pure, alcohol is colourless and has about four-fifths the weight of water. Its presence, in considerable proportions, in brandy and other spirits, wines and beers, gives these liquids their stimulating quality. Methylated spirit is practically pure alcohol, rendered undrinkable by nauseous components.

ALDERMAN, a senior member of the council of a city, municipality or county. One-third or one-sixth of a borough council is made up of aldermen, who are elected by the council as a whole, and hold office for six years. The mayor is elected from among the aldermen.

ALGAE, a large group of very simple plants, including the seaweeds. They range in size from the tiny varieties that turn ponds green, to the *Macrocystis* of southern seas, which has fronds several hundred feet long.

ALGEBRA is a branch of mathematics in which letters replace numbers for quantities, and symbols represent operations, such as multiplication, division and subtraction. Though it has the same laws as arithmetic, it covers a wider field of calculation.

ALHAMBRA, the splendid fort-palace of the Moorish kings built at Granada, Spain, in the thirteenth and fourteenth centuries. The word means "The Red Castle." It stands on a hill. Though partly ruined, enough of it remains to constitute one of the most wonderful surviving examples of Moorish architecture and sculpture.

ALIBI, a Latin word meaning "elsewhere," is the name given to a form of defence in a criminal prosecution which essays to prove that the person accused was in a place distant from the scene of the crime at the time when the crime was committed.

ALKALIS are a class of chemical compounds which have the property of turning red litmus blue, and neutralizing acids. They are combinations of hydrogen, oxygen and certain metals—sodium, potassium, lithium, etc.—and their carbonates. Washing-soda, caustic soda, carbonate of soda and ammonia are among the best known alkalis.

ALLIGATOR, a huge lizard-like reptile, belongs to the same family as the crocodile, from which it is distinguished by the nature of its teeth and its peculiar shorter and broader head. It is confined to the New World and China. The skin of some species of alligator is used as leather for the manufacture of fancy goods.

ALLOYS are mixtures of metals, or of metals and non-metals. Brass is an alloy of copper and zinc; gunmetal, of copper, tin and traces of zinc and lead; phosphor-bronze, of copper, tin and phosphorus; ordinary steel, of iron and carbon. Modern research has given us several alloys of steel with nickel, chromium, vanadium and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

other elements, possessing remarkable qualities as regards toughness and resistance to corrosion.

ALL SAINTS' DAY, formerly called All Hallows' Day and Hallowmas, is a festival of the Church dedicated to the Saints collectively. It falls on November 1. It is common to the Church of England and the Roman Catholic Church.

ALL SOULS' DAY is a festival of the Roman Church which commemorates, usually on November 2, all those who have died steadfast in their faith.

ALLSPICE, the ground-up berries of the West Indian tree, *Eugenia pimenta*, derives its name from the fact that its taste suggests a combination of the flavours of nutmeg, cloves, cinnamon and other spices.

ALLUVIUM is the silt or soil deposited by river water. The deltas of the Nile, Ganges and other rivers are due to the water being no longer able to hold the alluvium in suspension, when its speed sinks below a certain point, as the stream widens near the mouth.

ALMANAC, a calendar of the days, weeks and months of the year, combined with data about the phases of the moon, rising and setting of the sun, tides, festivals, anniversaries and other information. Some almanacs, such as *Whitaker's*, are large works of reference. The *Nautical Almanac*, commonly called the "Sailor's Bible," is issued annually by the Admiralty to assist navigation.

ALMONDS are the kernels of the nut-like fruit of the almond tree (*Prunus amygdalus*), which is cultivated in Spain, California and other warm countries. There are sweet and bitter varieties.

ALPHA AND OMEGA, the first and last letters in the ancient Greek alphabet, is the title given to God in Revelation i. 8, as signifying that He is "the beginning and ending" of all things in time.

ALPHABET, a list of the characters or letters used in a language. The word is a combination of the Greek words "alpha" and "beta," standing for A and B. The Italian alphabet contains only 21 letters, against our 26, dispensing with K, W, X, Y and J; whereas the Russian has 36, the Persian 45, and the Sanskrit 49.

ALTIMETER, a form of aneroid barometer, graduated in feet or metres, carried in aircraft to show altitude above sea level.

ALUM is the name commonly given to the double sulphate of aluminium and potassium, used chiefly in the manufacture of leather and paper, and in dyeing. Chrome alum contains chromium in place of aluminium.

ALUMINA, oxide of aluminium, is an intensely hard substance which occurs naturally in different forms as sapphire, ruby, emerald, emery and corundum.

ALUMINIUM is a soft, white metal, one of the elements, and the lightest metal in common use. It has only one-third the weight of iron, but relatively to its weight is strong. It does not corrode in pure air. Aluminium is used largely for cooking utensils and castings, and for electric conductors. Alloyed with small quantities of copper, magnesium, silicon, iron and manganese, it forms duralumin, a metal which is as strong as mild steel, though only slightly heavier than pure aluminium, and is employed for parts of aircraft.

Aluminium is obtained by fusing bauxite, an aluminous clay, and cryolite—fluoride of aluminium—in the electric furnace.

AMALGAM is an alloy of mercury with another metal. Silver and gold are extracted from crushed ore by means of mercury, which picks up the particles of metal and forms a pasty amalgam. When this is heated in a retort, the mercury evaporates, leaving the precious metal behind.

AMAZONS, in Greek legend, a race of warrior women who inhabited the Caucasus and waged war against Greece, Egypt and other countries. Under their queen Hippolyta they were vanquished by Hercules.

AMBER, the fossilized resin of pine trees, is a deep yellow, transparent substance, found most usually on the seashore, but also dug up in small quantities from the ground. Its Greek name, *elektron*, gives us our word electricity; for the ancients noticed that when rubbed it attracted small light objects.

AMBERGRIS, a grey, soap-like substance excreted by the sperm whale, which is of great value to makers of perfumes and fetches a very high price.

AMERICA'S CUP, a trophy offered by the Royal Yacht Squadron in 1851, for open competition. It was won by the New York yacht *America*, and presented by the owner to the New York Yacht Club. All the many attempts made by Sir Thomas Lipton, Lord Dunraven and other British sportsmen to recover it in races in American waters have been unsuccessful.

AMETHYST, a semi-precious stone of purple-blue colour. Chemically it is a form of quartz. The best amethysts come from Brazil, Ceylon and Germany.

AMMONIA, a gaseous combination of nitrogen and hydrogen, has a very pungent smell, is about half as heavy as air, and very soluble in water. One volume of water just above freezing point will absorb 1,150 volumes of the gas. Water thus impregnated is sold as "liquid ammonia" or "spirits of hartshorn."

AMMONITES, extinct creatures which inhabited spirally-coiled shells of beautiful

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

design, are found in great numbers as fossils in Permian, Jurassic and Cretaceous rocks.

AMŒBA, a tiny living creature, consisting of a speck of protoplasm, which moves in water or other liquid by continually altering its shape. The amœbæ belong to the protozoa.

AMPERE, the practical unit of the flow of electrical current, is that current which will flow when one volt of electrical pressure is applied to a circuit of one ohm resistance. It is named after André Marie Ampère (1775-1836), the French physicist.

AMPHIBIA, a group of vertebrate animals to which frogs, toads, newts and salamanders belong. They form a link between fish and reptiles. While young they live in water and breathe through gills like fish; but when adult they have lungs and breathe atmospheric air, and in most cases live entirely or chiefly on land.

AMPHITHEATRE, a structure surrounding a (usually) oval arena, in which the Romans held gladiatorial and other displays. Without a roof, the inside sloped down, as tiers of seats for the spectators, towards the arena. The modern stadium for athletic contests is a revival of the ancient amphitheatre.

ANABAPTISTS, a religious sect which appeared in Germany in the earlier part of the sixteenth century. They denied the efficacy of infant baptism and held political views of a socialistic nature that led to their suppression.

ANABASIS, the account given by the Greek historian Xenophon of the expedition (401-400 B.C.) of Cyrus the younger against his brother Artaxerxes, and of the retreat of the Ten Thousand Greeks through Babylonia and Asia Minor after the Battle of Cunaxa, in which Cyrus was killed.

ANACHRONISM, a mistake made by an author or artist, by introducing a reference or an object not belonging to the period referred to. Thus, Shakespeare is guilty of an anachronism in *Troilus and Cressida*, when he makes Agamemnon quote Aristotle, born several centuries later.

ANACONDA, a huge South American snake which lives in swamps and rivers. It is one of the largest of all snakes. Specimens up to 30 ft. have been captured.

ANAGRAM, a word or words formed out of another word or words by using the same letters in a different order. For example, the letters of "telegraph" may be converted into "great help."

ANALYST, PUBLIC, an official appointed by a local authority to analyse samples of foods and drugs brought to him by inspectors and to report on their quality. In order to carry out his duties properly he must be a highly-skilled chemist.

ANCHOR, a steel or iron instrument to enable a ship to moor itself to the bottom of the sea. The oldest form has a straight shank with a ring for the hawser and a crossbar, called the stock, at one end, and two curved arms, ending in flat triangular flukes, at the other. When the anchor is dropped, the stock, being at right angles to the arms, causes one or other fluke to dig into the ground. Most large anchors now are stockless, so that they may be drawn easily into the hawse-pipe; and have swivelling arms, both of which are able to get a hold simultaneously. A ship usually carries several anchors, the largest of which are known as the "sheet" anchors.

ANCHOVY, a small fish, allied to the herring, found in the Mediterranean and other waters. It is much valued for its savoury taste, and the sauce made from it is a favourite condiment with other fish.

ANDROCLES, a Roman slave, who, while fleeing from his master, entered a lion's cave, and removed a thorn from the animal's paw. After being recaptured he was set to fight a lion, which, instead of attacking him, showed signs of gratitude, being the lion which he had befriended. Androcles is the subject of a play by Bernard Shaw.

ANEMOMETER, an instrument for measuring the speed or pressure of the wind. The oldest form has four hemispherical cups at the ends of arms which revolve a vertical shaft. Speed is estimated from the number of revolutions made in a given time. The Dines anemometer makes use of the combined pressure and suction of the wind, blowing into and across openings, to move a pen which traces a line on a drum revolved steadily by clockwork.

ANEROID, a form of barometer consisting of a circular box, exhausted of air. Alterations in atmospheric pressure cause the top of the box to move in or out. Movements are imparted through levers and a chain to the spindle of a pointer on a dial. The word means "Having (or containing) no liquid."

ANGELUS, a Roman Catholic prayer beginning with this word, which is said by the priest at 6 a.m., noon and 6 p.m. At the same moments the Angelus bell is rung, so that all within hearing may join in the devotions.

ANGLES, the Germanic tribe which invaded England in the fifth century and settled along the eastern coast. England got its name from them.

ANILINE is a colourless, oily liquid derived from coal-tar benzene. It enters into the manufacture of artificial dyes of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

many different colours which have largely replaced natural dyes.

ANIMALCULE, a living creature of very simple character, so small that in most cases it is visible only under a microscope. Stagnant water often contains swarms of animalcules of various kinds.

ANISE is the seed-like fruit of a plant, allied to the parsley, cultivated in Germany, Egypt and elsewhere. Aniseed, as it is commonly called, is used in the making of liqueurs and flavourings. The essential oil extracted is employed in medicine.

ANNEALING is the process of rendering metals and glass less brittle, by heating them and allowing them to cool very slowly. This relieves them of internal strains caused by sudden cooling, hammering, rolling, etc.

ANT, a class of insects belonging to the same order as the bees and wasps, and, like them, highly specialized. Over 2,000 species are known to entomologists; three of them being found in Britain. Their intelligence, skill as architects and engineers, discipline and interesting habits —such as the milking of aphides and the cultivation of fungi—have made them a favourite subject of study and observation.

ANTARCTICA, the great continent surrounding the South Pole, has an area calculated at about 5,000,000 squares miles —about 60 per cent greater than that of Australia. Most of its surface is covered by a vast ice-cap, having an average thickness of 1,500 or more feet. Though its interior has been explored only in comparatively few places, it is known to contain lofty mountain ranges and what may prove to be the world's largest coalfield.

ANTHOLOGY, a collection of poems or short prose works of various authors, each item being complete in itself. The word means literally "a collection of flowers," and indicates that only the best work is selected. The earliest anthology was that of Meleager in the first century B.C. Among modern English anthologies Palgrave's *Golden Treasury* is one of the best known.

ANTHRACITE, a very hard and pure coal which burns without smoke and leaves very little ash behind. The largest worked deposits are in South Wales and Pennsylvania.

ANTHROPOLOGY, the study of the history of mankind from the earliest times. It is concerned with his physical, mental and spiritual development.

ANTICOMINTERN PACT, signed by Germany and Japan in 1936, and by Italy in 1937, an agreement against the spread of Communism. The word "Comintern" is an abbreviation for the Communist International (Third International), ostensibly dissolved by the Soviet in 1943.

ANTIMONY, a bluish-white, crystalline metal, 6.7 times heavier than water. Its peculiar property of expanding, instead of contracting, as it cools makes it valuable as a constituent of type metal and alloys used for small castings, since it ensures the moulds being completely filled.

ANTIPODES, the place on the further side of the earth through which a line drawn from any given spot through the centre of the earth would pass. The word means, literally, people with their feet turned towards one another. New Zealand is the nearest large area of land to the antipodes of England. The North Pole is the true antipodes of the South Pole.

ANTISEPTICS are substances which destroy the bacteria of putrefaction and disease. They are employed for dressing wounds and sterilizing clothes, instruments and other articles used during surgical operations. Among the most used are boracic powder, peroxide of hydrogen, lysol and carbolic acid.

APACHES, a N. American Indian tribe, which originally occupied a large part of the south-western parts of the United States, but is now practically confined to Oklahoma. Their fierce, bloodthirsty habits led to their name being applied to the criminal gangsters of Paris.

APE, a monkey with no tail or a short tail only. The gorilla, orang-outang and chimpanzee are among the apes. The word is, however, sometimes used loosely, though incorrectly, of monkeys generally.

APHIDES, also called green-fly and plant-lice, are insects which live on the juices of the young shoots of plants. They multiply at a great rate, a fresh generation being born every ten days or so. Though normally wingless, they are able to develop wings, if the supply of food runs short, and change their feeding-ground.

APHRODITE is the ancient Greek goddess of beauty and love, the Latin Venus. (*See* VENUS.)

APOCALYPSE, which means an "unveiling" of the future, is applied specially to the last book of the Bible—the Revelation of St. John. The Book of Daniel also is apocalyptic; and the Apocrypha includes the apocalypse of Esdras. Apocalypses may be defined as prophecies based on visions.

APOGEE, the point in the orbit of the moon which is farthest from the earth, or in the orbit of a planet which is farthest from the sun. When the moon is "at apogee" it is 253,000 miles away. The converse of apogee is named perigee.

APOLLO, one of the most widely

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

worshipped of the Greek gods, was the son of Zeus and Leto, and brother of Artemis. He punished crimes, and was the god of prophecy and the arts. His oracle at Delphi was the most famous in Greece. He was also a Roman god.

APPIAN WAY, the oldest, most celebrated, and best made of the ancient Roman military roads, ran southward from Rome through Alba Longa, Capua and Beneventum, to Brundisium (the modern Brindisi), and was about 350 miles long. It was begun in 312 B.C. by the Censor Appius Claudius, after whom it was named. A new road, parallel with the old, was constructed in the latter part of the eighteenth century as far as Albano. Near Rome the old Appian Way is flanked by many interesting memorials of ancient times.

APRIL, the fourth month of the year, gets its name from the Latin verb for "to open," as in that month buds and flowers are expanding quickly.

APSE, a semicircular or polygonal recess at the eastern end of a church. It projects from the end wall and is arched over, the front being open to the chancel.

APTERYX, or KIWI, a tailless and, as its scientific name implies, practically wingless bird, found only in New Zealand. It belongs to the same family as the ostrich. Its beak is long and curved, and its feathers are so narrow as almost to resemble coarse hair. Though carefully preserved, the various species of this bird are becoming rare.

AQUARIUM, a tank, or series of tanks, in which fish, other acquatic creatures and aquatic plants are kept alive. One of the finest aquariums in the world is that at the London Zoological Gardens.

AQUEDUCT, an artificial channel for conducting water from one place to another. Most aqueducts supply cities with good water from a distant source; but some are used for irrigation and industrial purposes. Those built by the ancients were artificial rivers, with a steady fall from end to end, and the water in them was not subjected to pressure. Tunnels had to be driven for them through hills, and great masonry structures reared to carry them across valleys. Many of the last are still in existence. Modern aqueducts make use of large pipes, able to stand high pressure throughout, or at least where depressions have to be crossed. The largest of modern aqueducts is that which takes water from the Catskill Mountains to New York, 92 miles away; the longest, that running from near Perth, in Western Australia, to Kalgoorlie, 350 miles farther east. The latter is unique in that the water does not flow through it by gravity, but has to be forced by pumps, as the point of delivery is much higher than the source. The chief British aqueducts are those from Lake Vyrnwy, Wales, to Liverpool; from Thirlmere to Manchester; and from the Elan Valley, Wales, to Birmingham. The oldest English aqueduct is the New River, connecting springs in Hertfordshire with a reservoir at Clerkenwell, London. It was built by Sir Hugh Myddleton in 1609-1613.

"ARABIAN NIGHTS ENTERTAINMENTS," a famous series of Eastern tales first translated into English from the Arabic by Lane and Burton about 1840. There has been much dispute as to the date at which they were written and it is probable that some are much older than others, fresh stories having been added by successive writers.

ARBITRATION, a method of settling disputes without recourse to law, strikes or war. The disputants may agree to accept the decision of a single arbitrator, or each may select an arbitrator, and they appoint an umpire, whose decision is final if the arbitrators cannot agree. In some countries arbitration is compulsory in labour disputes. The principle was the basis of the League of Nations. *(See* LEAGUE OF NATIONS.)

ARBOR DAY, a day devoted annually in the United States, Canada, Australia and elsewhere to the planting of trees in districts where trees are scarce.

ARCHÆOLOGY is the study of the works and doings of man in times far distant from the present, especially those of which there is no written history. By a close examination of the remains of building, tools, pottery and other articles which are visible on the surface or brought to light by excavation, the archæologist endeavours to build up a picture of the daily life, habits and civilization of a race. In some cases, as when dealing with the earliest epochs of man's history, knowledge is entirely dependent on the results of archæological research. In others, such research amplifies and confirms written history or tradition: as, for example, the excavations at Troy and Ur of the Chaldees.

ARCTIC REGIONS, lying inside the Arctic Circle, include most of Greenland, parts of the continents of Europe, Asia and North America, and a large number of outlying islands. These surround the Arctic Ocean, which is almost entirely shut off from the Pacific Ocean, but has a connection with the Atlantic Ocean nearly 1,000 miles wide between Greenland and Norway. The North Pole is surrounded by a vast stretch of ice which apparently has water under it everywhere. Soundings

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

made by Peary at the Pole itself revealed a depth of over 1,500 fathoms. The most notable animal peculiar to these regions is the white or polar bear, which is not found in the Antarctic. On the other hand, penguins, which swarm in the South polar continent, are unknown in the Arctic.

The North Pole has been attained once on foot. This was accomplished by Commander Peary, on April 6, 1909. On three occasions aircraft have passed over it. On May 9, 1926, Lt.-Commander R. E. Byrd, of the United States Navy, and Floyd G. Bennett reached it in an aeroplane, and three days later the airship *Norge*, piloted by Col. Nobile, and having the Norwegian explorer Roald Amundsen (1872-1928) on board, crossed it during a flight from Spitzbergen to Alaska. On April 15, 1928, Capt. (later Sir) G. H. Wilkins and Carl B. Eielsen flew over the Pole in the reverse direction. A temporary camp for the study of weather conditions was established by Prof. O. Schmidt at the North Pole in 1937.

ARCTURUS, the third brightest of the stars visible in the Northern hemisphere, in the constellation Böotes.

ARES, the Greek god of war, corresponding to the Roman Mars.

ARGON, a gas existing in very small quantities in the atmospbere, was discovered by Lord Rayleigh (1842-1919) and Sir W. Ramsay (1852-1916) in 1894. It is half as heavy again as air. Its name means "inactive" and was given it because it will not combine with any other known element.

ARGONAUTS, the sailors who accompanied Jason to Colchis in the ship *Argo*, to fetch the Golden Fleece.

ARGUS, a monster of Greek mythology, possessing 100 eyes, all of which were never closed at once. After his death Juno placed his eyes in the peacock's tail.

ARIADNE was the daughter of Minos, King of Crete. When Theseus entered the labyrinth to kill the Minotaur, she provided him with a skein of thread which he unwound on the way in, and so was able to find the entrance again.

ARIANISM, a doctrine founded by Arius (A.D. 256-336) of Alexandria, held that Christ was not of the same substance as God, and therefore not equal with Him, but merely the most nearly divine of human beings.

ARMADA, SPANISH, a great expedition sent in 1588 by Philip II of Spain to conquer England. It consisted of 130 ships, carrying 28,000 men, and was commanded by the Duke of Medina Sidonia, a soldier. Leaving Corunna on July 12, it entered the Channel five days later, and there was followed by 191 British vessels, many of them very small, under Lord Howard of Effingham. Superior seamanship enabled the British to hunt the Spaniards up the Channel, and compel them to make for Spain round the north of Scotland. During the fighting and storms following it the Armada lost over 60 vessels.

ARMADILLO, a S. American quadruped, having its body protected by a covering of bony plates. Like the hedgehog, it rolls itself into a ball when alarmed.

ARMAGEDDON, "The Mountain of Megiddo," is made in Revelation xvi. 16, the scene of the final destruction of the powers of evil. The word is used of a general war between nations.

ARMISTICE, a cessation of fighting by agreement between belligerents, usually as a preliminary to discussion of terms of surrender or peace. November 11 is called Armistice Day, because on that day in 1918 the Germans signed the Armistice which ended the First World War. An armistice was signed by France on June 21, 1940.

ARROWROOT is a form of starch prepared from the roots of various tropical plants grown in the W. Indies, E. Indies, Brazil and elsewhere. It is a very nutritious and easily digested food.

ARSENIC, a steely-grey crystalline substance, one of the elements. It is used in the leather and paint industries. Compounds of arsenic are extremely poisonous to animals and plants.

ARTEMIS, the Greek goddess of hunting, sister of Apollo. She corresponds to the Diana of the Romans.

ARTESIAN WELL, a well sunk into a stratum from which the water rises to the surface by its own pressure. Named after Artois, in France, where the first wells of this kind were made. Usually bored with a drill and lined with steel pipes.

ARTIFICIAL SILK. (*See* RAYON.)

ARTILLERY is a term which covers the cannon used by an army or defence force, the art of using them, and the men who operate them. Artillery may be grouped under two heads: field artillery, with mobile guns, and heavy artillery, including howitzers, mortars and siege guns of large calibre. During the First World War cannon of all kinds were used in land warfare, from small quick-firers up to the gigantic 18-inch howitzers, and "Berthas" of 70 miles range, employed by the Germans. Self-propelled guns were introduced during the Second World War, which saw great developments in every branch of artillery. One of the most interesting of them was the Smith gun, which was brought into use by the Home Guard when

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the invasion of Britain was imminent. Able to fire both anti-personnel and anti-tank shells, the gun and ammunition were placed between disc wheels. On coming into action the gun and trailer were overturned, the right-hand wheel serving as base for the mounting and the left-hand wheel providing cover for the gun crew. The gun and trailer could be manhandled or towed by a small motor vehicle or horse. Anti-tank and anti-aircraft guns, used for specific purposes, underwent considerable change during the campaigns in the various theatres owing to the evolution of the weapons for which they were antidotes. The two-pounder quick-firing anti-tank gun was followed by a six-pounder and a seventeen-pounder, and the three-inch and thirteen-pounder anti-aircraft by weapons capable of engaging a flying enemy travelling at a great height.

ASBESTOS is a fibrous mineral which can be teased out like wool or cotton, and is able to resist great heat. It may be spun into thread, woven into cloth, or compressed into a cardboard form. It is used for keeping heat in or out, rendering safes and chambers fireproof, and for filtering liquids.

ASCOT RACES are held annually and are usually attended by royalty. They were instituted in 1711. The chief event is the race for the Ascot Gold Cup, over a course of 2½ miles.

ASH, a forest tree, a native of the British Isles, the tough wood of which is used for tool handles, aeroplane parts, shafts and frameworks. One variety, the mountain ash, bears brilliant red berries.

ASH WEDNESDAY is the first day of Lent. Named after the old custom of sprinkling ashes on the heads of penitents on that day.

ASPHALT, a combination of bitumen with porous rock or earthy matter. Rock, or hard, asphalt comes chiefly from France and Switzerland; crude asphalt from Trinidad. The two kinds are mixed together for surfacing roads and paths. Soft asphalt is used alone for waterproofing roofs, walls, etc.

ASTEROIDS, also called minor planets, are small bodies which revolve round the sun in orbits lying between those of Mars and Jupiter. About 2,000 have already been recorded. The largest is Ceres, 485 miles in diameter. They are probably the fragments of a large disrupted planet.

ASTROLOGY, the so-called science of foretelling events from the movements and positions of the heavenly bodies. It dates back to very early times, and still has followers, though now generally discredited. Nothing probably did more to bring it into disrepute than the discovery of new planets—Uranus and Neptune—which left the astrologers in an awkward dilemma, since their calculations had, of course, previously left these out of account. Survivals of the science are seen in our words "jovial," "saturnine" and "mercurial," which connect certain of the planets with the dispositions of people born "under" them.

ASTRONOMY, the science of the heavenly bodies, is the oldest of the sciences. It was much intermingled with astrology till Copernicus, in the early years of the sixteenth century, made it clear that the earth was not the centre of the universe—as had previously been held by the astronomer Ptolemy—but, like the other planets, a body revolving round the sun; and that the apparent motions of the heavenly bodies were due to the earth rotating on its own axis. The invention of the telescope a century later revealed many secrets that had hitherto been hidden. Kepler (1571-1630), Galileo (1564-1642) and Newton (1642-1727), by their observations and physical and mathematical discoveries, may be said to have launched astronomy as an exact science. Since their time telescopes of successively greater power have enabled astronomers to probe farther and farther into space; while photography has made it possible to record millions of stars invisible through the most powerful instrument, and the spectroscope has revealed the composition of many of the heavenly bodies. Modern astronomy includes calculations of the distance, size, mass, heat and velocity of stars unimaginably distant from the earth; and is expanding in a remarkable degree our knowledge of the universe as a whole.

ATALANTA, an Arcadian princess of Greek legend, who was the swiftest of mortal runners. She refused to marry any man whom she could outstrip in a race. Hippomenes beat her by dropping golden apples, which she stopped to pick up.

ATAVISM is the development of physical or mental characteristics derived from more or less remote ancestors, but not apparent in intervening generations.

ATHENE, or Pallas, who sprang armed from the head of Zeus, was the Greek goddess of war and the sciences and arts. She was regarded by the Athenians as their patron goddess, and they built in her honour a magnificent temple, called the Parthenon, on the Acropolis overlooking their city. (*See* MINERVA.)

ATLANTIC CHARTER, a summing up of the aims and principles of Great Britain and the U.S.A. in the Second World War by Mr. Winston Churchill and the late President Franklin Roosevelt, in August, 1941. They were as follows:

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Their countries seek no aggrandizement, territorial or other. They desire to see no territorial changes that do not accord with the freely expressed wishes of the peoples concerned. They respect the right of all peoples to choose the form of government under which they will live, and they wish to see sovereign rights and self-government restored to those who have been forcibly deprived of them. They will endeavour, with due respect for their existing obligations, to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity. They desire to bring about the fullest collaboration between all nations in the economic field with the object of securing, for all, improved labour standards, economic adjustment and social security. After the final destruction of Nazi tyranny, they hope to see established a peace which will afford to all nations the means of dwelling in safety within their own boundaries, and which will afford an assurance that all the men in all the lands may live out their lives in freedom from fear and want. Such a peace should enable all men to traverse the high seas and oceans without hindrance. They believe that all the nations of the world, for realistic as well as spiritual reasons, must come to the abandonment of the use of force. Since no future peace can be maintained if land, sea or air armaments continue to be employed by nations which threaten, or may threaten, aggression outside of their frontiers, they believe, pending the establishment of a wider and permanent system of general security, that the disarmament of such nations is essential. They will likewise aid and encourage all other practicable measures which will lighten for peace-loving peoples the crushing burden of armament.

ATLANTIS, an island which, according to ancient legends, existed at one time in the Atlantic Ocean, west of the Straits of Gibraltar, but was submerged by the sea.

ATLAS, Titan, who, for leading the other Titans against the gods, was condemned to carry the heavens on his shoulders.

ATMOSPHERE, a layer of gases enveloping the earth or other heavenly body. Our own atmosphere, consisting mainly of a mixture of nitrogen and oxygen (*see* AIR), is probably about 200 miles thick. Since air is elastic and compressible by its own weight, the density and pressure of the atmosphere decrease with increase of altitude above sea level, being halved every 3½ miles or so. It is usually regarded as divided into 2 layers: the troposphere, about 10 miles thick, next the earth, and containing clouds and vapour; and the stratosphere, outside the troposphere, and free from moisture and winds. Actual experiments show that the temperature of the air falls with increase of altitude up to the limit distances yet reached by balloons. But there are reasons for thinking that the upper regions of the stratosphere are hotter than the troposphere, owing to the bombardment of the air by ultra-violet rays The atmosphere is essential to life as we know it, since it supplies us with oxygen for breathing, and screens us from intense heat by day while preventing a disastrous radiation of heat at night.

The moon has no atmosphere; but the sun has one consisting of intensely hot gases. Jupiter is thought to be enveloped in an atmosphere consisting of marsh gas and ammonia.

ATOM was regarded for many years as the smallest unit of matter. It is believed to consist of a central nucleus surrounded by a greater or smaller number of particles known as electrons. It can be visualized as a partnership of one or more positive protons with one or more electrons—particles of negative electricity. In the lightest known element, hydrogen, a single proton and a single electron constitute an atom. Experiments have been carried out for a long time to try and use the immense amount of energy that was found to be stored in the atom. The best results were obtained by using certain types of uranium, especially that known as U.235. Experiments were speeded up during the Second World War by a body of scientists banded together from various countries; these eventually reached success in 1945 by the production of atomic bombs. These bombs were used with devastating results against the Japanese. It was found that vast stores of energy locked up in the uranium are set free in one prodigious flash. A part of the uranium ceases to exist as matter and turns into energy.

ATTORNEY, a person formally appointed, usually by a deed called a "power of attorney," to act generally or in certain capacities on behalf of another.

AUK, a northern sea bird, very expert at diving. The great auk, a bird about as large as a goose, is now extinct; but the little auk, of about the size of a blackbird, is still common in the Arctic regions, and sometimes visits Britain.

AURORA BOREALIS, or NORTHERN LIGHTS, is a luminous display seen in the north polar regions during spring and autumn. The corresponding display in the south polar regions is called Aurora Australis. It usually takes the form of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

an arch from which hang curtains of green, red, violet and other colours. The cause of an aurora is thought to be disturbances in the electrical condition of the air.

AUTOGIRO, a heavier-than-air flying machine, which is supported in the air by horizontally revolving vanes radiating from the top of a short mast. Invented by Juan de la Cierva, a Spanish engineer, and popularly called a "windmill plane." An autogiro has a body, airscrew and tail similar to those of an ordinary aeroplane, and two short balancing planes projecting from the body. The "windmill" is set in motion before an ascent, and is kept revolving by the reaction of the air. Its position well above the centre of gravity of the machine gives it the effect of a parachute, so that when the engine is cut out an autogiro sinks on an even keel at a much steeper angle than an ordinary aeroplane. Loss of speed cannot cause it to stall and nose-dive.

AUTO-SUGGESTION, the persuading of oneself into a certain mental or physical condition by thinking of it. Auto-suggestion may cause a person to think himself ill, and even to experience the symptoms of a really non-existent complaint; and, on the other hand, it may help to improve his physical state, where no organic disease is present, by the determination to feel better. A French doctor, Emile Coué (1857-1926), claimed to have effected many cures by auto-suggestion.

AXIS.—Originally a political agreement entered into by Germany and Italy in 1936, it became a military alliance in 1939. Japan joined it in the following year, when the Tripartite Pact was signed.

AVALANCHE, a large mass of snow or ice rushing down a mountain slope.

AVERNUS, an extinct volcano near Naples which the Romans regarded as the entrance to the infernal regions.

AZTECS, the inhabitants of Mexico at the time when that country was conquered by the Spaniards under Cortez in 1520. They were in some respects highly civilized, as the many remains of their temples and other structures testify.

BAAL, the sun-god of the Canaanites and Phœnicians, of worshipping whom the Israelites were guilty during the reign of Ahab. The word occurs as part of Baalbek and Hannibal.

BABOONS are a class of African monkeys with heads shaped much like that of a dog. They live together in large colonies, generally on rocks, and are very destructive of crops.

BACILLUS, a tiny rod-shaped living organism, a few varieties of which are able to cause disease; a disease germ. It is visible only under a powerful microscope.

BACTERIOLOGY is the science dealing with bacteria, a word which covers the bacilli of diseases and micro-organisms which produce fermentation, decay and other chemical changes in animal and vegetable matter.

BADGER, a burrowing animal, related to the bears, still fairly common in some parts of Britain. It is of about the size of a fox, and has grey fur marked with black, and its feet carry formidable claws. It lives in a burrow, which it leaves only in the dusk and at night. It feeds on insects, birds and small animals. When tamed it makes an interesting and highly intelligent pet.

BALEEN, or WHALEBONE, is a horny substance, in the form of long plates, which is found in the toothless whales. Curtains of baleen on either side of the jaw act as strainers which enable the whale to separate from the water much of the food on which it lives.

BALLET, a dramatic entertainment or interlude in which a story is expressed by dancing and motions of the body and limbs. It originated in Italy in the fifteenth century, and afterwards was much developed in France, England, Russia and U.S.A.

BALLISTA, a military engine used by the Romans for hurling large stones against a besieged city.

BALLISTICS, the study of the laws governing the flight of bullets and shells through the air, and of the use of explosives for propelling projectiles.

BALLOT is a secret method of voting. It was introduced for parliamentary and municipal elections in the United Kingdom by the Ballot Act of 1872, and is now practically universal. The usual process is to mark a paper in a screened booth, fold it, and drop it into a sealed box. In the U.S.A. a mechanical apparatus is used, the voter pressing a knob to record his vote.

BALSAMS are gummy, oily substances derived from certain trees and other plants. As a class they have a pleasant smell, and are used in the manufacture of soaps and perfumery and for medicinal purposes.

BAMBOO, a giant grass with hard, woody stems which, on account of their strength and lightness, are put to many uses, ranging from the construction of houses to the supporting of plants. In tropical countries bamboos grow to a height of 70-100 feet.

BANANA, a tropical plant which bears large clusters of a nutritious fruit called by the same name. It is cultivated chiefly in the West Indies, and notably in Jamaica, from which island enormous quantities of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the fruit are sent in specially equipped ships to Europe and the United States. Bananas yield more food to the acre than any other crop—up to 20 tons.

BANDICOOT, an Indian rat, about as large as a rabbit. The name is also applied to several species of small Australian marsupial animals, some of which burrow in the ground.

BAND OF HOPE, an organization founded in 1855 for inculcating the principles of temperance among children.

BANNS OF MARRIAGE, an announcement of a forthcoming marriage, read out in a place of worship of the Church of England. When a marriage is to be "after banns," the banns must be read on three consecutive Sundays in the parish churches of the parishes in which the two parties reside.

BANYAN TREE, a species of fig tree, native to India, that sends down from its branches shoots which take root and form additional trunks. Owing to this habit of growth, a banyan may in course of time cover a large area of ground.

BAOBAB, an African tree with a trunk of great diameter relatively to its height. Specimens with trunks 20-30 feet thick are known. The baobab bears a gourd-like fruit, containing a sour pulp of which monkeys are very fond.

BAPTISM, the religious rite of sprinkling a person with water, or immersing him or her in it, as a sign of admission to a Christian church. It signifies the washing away of sin and the bestowal of grace; and in the case of infants is accompanied by the giving of Christian or baptismal names.

BAPTISTS, a Christian denomination which maintains that baptism should consist of the complete immersion of the baptized, and be conferred only on persons sufficiently old to be believers.

BARBERRY, or BERBERIS, a genus of ornamental and flowering shrubs, some species of which are evergreen. The common barberry bears long, red, acid berries, used for preserves.

BARBICAN, an outwork protecting the entrance to a castle or fortified city, and enabling a flank fire to be directed against besiegers. A London street, the Barbican, is named after a structure of this kind that once stood near the Aldersgate.

BAREBONE'S PARLIAMENT was an assembly summoned by Cromwell in 1653, after the expulsion of the "Rump" Parliament. It contained 140 members, lasted from July to December, and was named after Praise-God Barebone, a Fleet Street leather merchant who took a prominent part in it.

BARIUM, a white metallic element, very difficult to separate from its compounds, isolated in 1808 by Sir Humphry Davy. It is used chiefly in fireworks and the manufacture of paints.

BARK, the covering of the stem and branches of a tree or shrub, consists of an outer and an inner layer. The outer, which becomes corrugated by age in many species—such as the elm, oak and sweet chestnut—is protective. The inner, or "bast," layer includes, on its interior side, the cambium tissue which every year adds a ring to the centre of the tree and distributes the sap. Traversing the bark are horizontal channels, called lenticels, through which—except in winter—air and moisture reach the interior of the tree.

BARLEY is one of the most valuable of the cereals, being able to thrive in cold countries unfavourable to wheat. The ears are distinguished by long, hair-like spikes or bristles. Barley meal is used for feeding live-stock. The husked grain, called pot-barley, and polished, or pearl, barley are used in broths and puddings. A large part of the barley grown in Britain is devoted to the brewing of beer and the distillation of whisky.

BARNACLE, a species of shell-fish which attaches itself by a long sucker to a ship's bottom, or to the piles of a pier or other marine structure.

BAROMETER, an instrument for measuring the pressure of the atmosphere. The ordinary mercurial barometer is a glass tube sealed at one end and about 3 feet long, which, after being filled with mercury, is inverted with its open end in a receptacle containing mercury. There being no air above the liquid, this is forced upwards by atmospheric pressure until the weight of the column exactly balances the pressure. Alterations of pressure are shown by a corresponding rise or fall of the top of the column, the extent of which is reckoned from a scale alongside. Barometric changes, taken in conjunction with the direction of the wind and the moisture contents of the atmosphere, foretell with considerable accuracy coming changes in the weather. A sudden, heavy fall almost invariably precedes a severe storm. The non-mercurial type of barometer is treated under ANEROID.

BARON, a member of the lowest grade of the British peerage. The word originally applied to persons who held lands from the king, either directly, as in the case of the greater barons, or indirectly, as lesser barons, through one of the first class. Since the time of Richard II new barons have been created chiefly by letters patent.

BARONET, the lowest title of hereditary rank, was instituted by James I, who demanded a fee of £1,095 from everyone on whom a baronetcy was conferred. A

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

baronet is distinguished from a knight by the title (usually shortened to Bart.) being placed after his name.

BARQUE, a three-masted sailing-ship with square sails on the fore- and main-masts, and fore-and-aft sails on the mizzen.

BARQUENTINE, a three-masted ship, with the foremast square-rigged and the other two fore-and-aft rigged.

BARRISTER, a person qualified to plead cases in the higher courts of England and Ireland. His work is not, however, confined to the courts, as much of it may be of a consultative character and done in his private chambers. To become a barrister it is necessary to enter one of the four Inns of Court, keep a number of terms and pass certain examinations. This having been accomplished, the candidate is "called," that is, formally enrolled a member of the profession. A junior barrister, a member of the Junior Bar, wears a stuff gown. If appointed a King's Counsel (K.C.) he becomes a member of the Senior Bar, and exchanges his stuff gown for one of silk—hence the phrase "to take silk." Doing so excludes him from following certain lines of legal business, but it is a necessary step to the highest offices, such as Attorney-General.

BARROW, a mound of earth or stones heaped over an ancient burial-place. It is a simpler form of the stone or brick pyramid. Many barrows are scattered over the downlands of Britain, some of them so large that they must have entailed an enormous amount of labour.

BASE, in the chemical sense, signifies an oxide or hydroxide which is able to combine with an acid to form a salt.

BASQUES, a race of very ancient origin, inhabiting the western parts of the Pyrenees. They have a language of their own, entirely different from either French or Spanish, and very difficult to learn. They are a hardy people, and excellent seamen and agriculturists.

BAS-RELIEF is a form of sculpture in which the objects represented project only a small distance from a flat background. The Greek Elgin Marbles, now in the British Museum, are a fine example.

BASS, a large sea-perch, which gives excellent sport with a rod and line.

BASTILLE, a famous prison-fortress in Paris, the storming of which by a mob on July 14, 1789, was one of the opening events of the French Revolution. Its site is now marked by a column.

BATH-BRICK, used for scouring metals and stone, is made at Bridgwater, in Somersetshire, from a very fine quartz sand found in the bed of the River Parret.

BATH, ORDER OF THE, an order of chivalry, was founded in 1399 and remodelled in 1725 and 1815. Since the latter date the membership has been enlarged many times. It is conferred on both military persons and civilians, and now is made up of three classes: Knights Grand Cross (G.C.B.); Knights Commanders (K.C.B.) and Companions (C.B.). The badge of the Order represents a rose, a thistle and a shamrock, and bears the motto "Tria juncta in uno" (Three united in one).

BATH STONE, an oolitic building stone obtained from quarries near Bath, in Somersetshire. It occurs as underground deposits which are mined by tunnelling in much the same way as coal. It is of a light yellowish or buff colour, and when first extracted is soft. Exposure to the air causes it to harden.

BATS are mammals which are enabled to fly by large membranes between the front and back limbs. The bones of the arm become, in the case of a bat, very long fingers or ribs attached to the membranes. In some cases the membranes extend from the back limbs to the tail. Bats fly by night, and in the main they feed on insects, though certain tropical species, including the flying fox, feed on fruit, and the S. American vampires suck the blood of animals.

BAUXITE, a clay found in France, Ireland and the United States, which is one of the chief sources of aluminium. Chemically, it is a compound of that metal, oxygen and hydrogen, intermixed with earthy matter.

BAYEUX TAPESTRY, a unique piece of needlework once supposed to have been executed by Matilda, wife of William the Conqueror, and now in a museum in the French town from which it gets its name. It is a linen strip about 20 inches wide and over 200 feet long, on which are worked a large number of scenes relating to the conquest of England, ending with the Battle of Hastings.

BEACON is a term which covers objects of all kinds set up to give signals or other information; such as fires on eminences, structures marking the fairway of a channel, piles of stones to assist surveying, and lighthouses. In olden times, signalling was done by beacon fires on the tops of hills and mountains, some of which—for example Dunkery Beacon, Brecknock Beacon and Malvern Beacon—have names recalling their use. Aerodromes and airways are illuminated with electric beacons.

BEANS are the seeds of species of leguminous plants. As a class they contain much nitrogen and starch, and many of them, such as the haricot and broad bean, are nutritious foods. The latter is commonly consumed in the unripe condition.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as the runner or French bean, for the sake of its large, fleshy pod. Horse beans are cultivated as a food for horses and cattle. In recent times the soya bean, grown in Manchuria, China and Japan, has attained great commercial importance as a food and the source of a valuable oil.

BEARS are a group of flesh-eating mammals, with broad, flat feet, and teeth suitable for dealing with a mixed diet, including roots, fruit and insects. The white, or polar, bear and the grizzly bear of the Rocky Mountains are large and formidable animals. The various species are very widely distributed. Most bears are good climbers and able to stand upright.

BEAVER, a large rodent, once common in Europe, but now found only in N. America. Its length varies between 30 and 36 inches. The beautiful soft fur of the beaver has led to its being so mercilessly hunted that the species is in danger of extermination. Beavers live in colonies, and are very interesting animals, on account of their habit of building houses or lodges in water, which, if not deep enough for their purpose, is impounded by very ingeniously-constructed dams, composed of trees felled by gnawing through the trunks.

BEDFORD LEVEL, a tract about 600 square miles in area of the fen country in Lincoln, Norfolk, Suffolk, Huntingdon, Northampton and Cambridgeshires. It was named after the Earl of Bedford who in 1634 was granted about a quarter of it on condition that he drained it. A great part of it has been rendered fit for cultivation.

BEDOUINS are nomadic, or wandering, Arabs living in tents and roaming over a tract extending from Persia, in Asia, to the Atlantic Coast of Africa. They are essentially desert-dwellers, and are noted for their hospitality to strangers. They live together as tribes, each under the control of a sheikh.

BEECH, one of the most beautiful of our larger trees, distinguished by its graceful shape, smooth grey stem and attractive foliage, which turns yellow and red in the autumn. When grown under forest conditions the stem of a beech tree runs up many feet before throwing out branches. Beechwood is used in the manufacture of chairs, other furniture and tools.

BEER, an alcoholic beverage produced by fermenting a decoction of barley malt and flavouring it with hops. The alcoholic strength is governed by length of fermentation, and the taste depends largely on the proportion of hops used.

BEES are four-winged insects having their bodies covered with a multitude of very fine hairs. The common hive bee is valuable as the producer of honey, and very interesting on account of its great intelligence, clever workmanship and industry. A colony of these bees consists of a queen-bee, which does all the egg-laying; a number of drones or male bees; and a much larger number of neuter or imperfectly developed female bees, which construct cells, fill some with honey, and act as nurses to the larvæ or grubs of the next generation. When a hive becomes overcrowded, the queen, accompanied by the major part of the worker bees, flies away to establish a new colony, leaving the hive to be populated afresh by the offspring of one of the young queens being hatched out.

BEESWAX is the yellow wax produced by bees and used in the construction of the combs of a hive. Dissolved in turpentine it makes a useful polish for floors and furniture.

BEET, a group of plants with long, tapering roots rich in sugar. The garden beet, grown as a vegetable, has a root of a deep purple-red colour. The other most important variety is the white, or sugar, beet, somewhat resembling a mangold, which, since the later part of the eighteenth century, has been cultivated increasingly in Europe as a source of sugar *(see* SUGAR*)* and since the First World War has become important to British agriculture.

BEETLES are an order of insects distinguished by a hard cuticle or skin, and one pair of wings which act as covers or cases for a pair used in flight. A large proportion of the 180,000 or so species known do not fly.

BELLS have been used since very early times for summoning people together, or giving warnings; and their employment in connection with religious worship dates back to the opening centuries of the Christian era. Russia owns the largest bells yet cast, of 200, 128 and 60 tons respectively. The first, made in 1733, were spoilt in the casting and have never been hung. The heaviest British bells are: Great Paul (St. Paul's Cathedral), 17½ tons; Big Ben (Westminster), 13½ tons; and Great Peter (York Minster), 10¾ tons. Bell-founders use an alloy of copper and tin. The tuning of a bell after casting requires great experience and good judgment. Bells are sounded either by pealing them, that is, swinging them through a large part of a circle; or by tolling, in which case the bell is swung mouth downwards against the clapper; or by chiming them while stationary with hammers striking them outside. The last method is used for tubular bells and in ringing carillons.

BENEDICTINES, an order of monks

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

founded in the sixth century by St. Benedict. To this order belonged St. Augustine, who at the end of that century converted the southern part of England to Christianity and became the first Archbishop of Canterbury.

BENZENE, or BENZOL, is a colourless liquid, chemically a hydrocarbon, derived from coal tar. A good solvent of rubber, resins and fats, and the source of aniline dyes and many other substances. It must not be confused with benzine or benzoline, one of the lighter constituents of petroleum.

BERBERS, a race of Hamitic origin which forms a large part of the population of Algeria and Morocco. A succession of Arab invasions during the Middle Ages drove them into the Atlas Mountains. Since then they have intermingled racially with the Arabs to a considerable extent, and have adopted the Mohammedan religion. As the French and Spanish have discovered at heavy cost, the Berbers are stubborn fighters.

BERYL, a precious stone, yellow, bluish, white or green in colour, and chemically a combination of the metals aluminium and beryllium with silicon. The higher grades of green beryl are called emeralds.

BESSEMER PROCESS, a process of steel-making invented by Sir Henry Bessemer, in 1856, which revolutionized the steel industry by cheapening production very greatly. It consists in blowing air through molten cast-iron in a chamber, called a converter, until the carbon and other impurities have been burned out of it; and then adding sufficient carbon to produce steel of the desired quality. It has now been largely replaced by more recent processes, notably the open-hearth.

BETEL NUTS are the seeds of a palm grown in the Malay Peninsula. In India and Malaya the nut is sliced, sprinkled with lime, wrapped up in a leaf of the betel pepper—a climbing plant—and chewed.

BEVERIDGE REPORT.—A survey of existing national schemes of social insurance and allied services, including workmen's compensation, together with recommendations, which were of a far-reaching nature. Took its name from Sir William Beveridge, chairman of the Committee on Reconstruction Problems set up in June, 1941, by the British Government. It was a Plan for Social Security, otherwise, "freedom from want."

BIBLE, the collection of writings recognized as sacred by the Christian Church, consists of two main parts: the Old Testament, of 39 books, relating to pre-Christian times, and written originally in Hebrew and Aramaic; and the New Testament, including the four Gospels, the Acts of the Apostles, 21 Epistles, and the Revelation, and written originally in Greek. The Apocrypha, a collection of fourteen writings, belongs to the Old Testament period. It is not recognized as canonical, or inspired, by the Anglican Church, though accepted by the Roman and some Protestant Churches.

The Old Testament was translated into Greek at various times between 300 B.C. and A.D. 300; and the Bible as a whole was translated into Latin in the second century. The Latin version, called the Vulgate, produced by St. Jerome in A.D. 392-404, is now accepted by the Roman Catholic Church as the final authority.

The first complete translation of the Bible into English was that made by Wycliffe towards the end of the fourteenth century; the first complete printed edition, that of Miles Coverdale (1535). This was followed by Matthews's Bible (1537), the Great Bible (1539) and the Bishops' Bible (1568). On the last was based the Authorised Version, prepared by order of James I, and published in 1611. The Revised Version of the New Testament appeared in 1881; that of the Old Testament in 1885.

The Bible contains about three-quarters of a million words. It has been translated into over 900 languages, and sells in larger numbers than any other book.

BIBLE SOCIETY, THE BRITISH AND FOREIGN.—This is the most important of the Bible-distributing societies. It was founded in 1804, by which year the Bible, or parts of it, had been translated into 72 languages. The Society now publishes or circulates the Bible, or parts of it, in 764 languages in all parts of the world, much of the work being done by colporteurs native to the various countries. In a typical year, ended March 31, 1939, the Society issued 1,091,874 complete Bibles, 1,273,805 New Testaments, and 8,673,812 integral books of the Bible.

BICYCLES first came into use about 1840, when MacMillan produced a low machine with rear wheel driven by levers. It was succeeded in the 'sixties by the wooden-wheeled "boneshaker" with cranks and pedals on the front wheel. This developed into the rubber-tyred high or "penny-farthing" bicycle, with large front and small rear wheel. The safety bicycle, with wheels of equal size and chain-driven rear wheel, appeared in 1885; solid tyres were replaced by cushion tyres soon afterwards; and in 1888 J. B. Dunlop introduced the pneumatic tyre, which definitely established the popularity of cycling.

BIRCH, a hardy tree distinguished by its silvery bark and graceful pendulous

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

branches. The bark of one species is used by Indians for canoe-building.

BIOLOGY is the science which deals with life in all its forms. It includes zoology and botany; and studies the processes of growth and decay, the evolution of species, heredity, sex and the nature of life itself. It is thus the most comprehensive of all sciences.

BIRD OF PARADISE is the name of a family of birds found in part of Malay Archipelago. The males of some species have extremely beautiful plumage.

BIRDS, the class of vertebrate or backboned animals distinguished by having their bodies covered with feathers, and by fore-limbs developed into wings. Like reptiles, to which they are more closely related than to mammals, they are reproduced from eggs. Only a few species, including the ostrich, emu, penguin, auk and apteryx, have wings too rudimentary to be of use for flight. Birds of the gallinaceous family are valued for their flesh; others for their plumage; and others for their sweet song. Birds with long, narrow wings are capable of prolonged flight; those having short, broad wings use them only for moving from place to place in search of food or when alarmed. Many species migrate northwards in spring, southwards in summer. The largest and heaviest bird, the ostrich, lays eggs as big as a coconut; while the tiny humming-bird, weighing only a few grains, produces eggs hardly larger than sugar-plums.

BIRETTA, a square cap worn by Roman Catholic, and some Anglican, clerics.

BISLEY, in Surrey, is the great centre of British rifle-shooting competitions. Since 1890 the National Rifle Association has held its annual meetings there. (*See* KING'S PRIZE.)

BISMUTH is a white, brittle metal which melts at a considerably lower temperature than lead. Mixed with lead and tin it makes solders that melt very easily; and the addition of cadmium produces alloys able to fuse in hot water. Bismuth is useful in medicine for stomachic troubles.

BISON, the wild ox of North America, which formerly roamed the prairies in vast herds. When the species had been almost exterminated, the few survivors were carefully protected, and their descendants are now multiplying in certain parts of Canada.

BITTERN, a bird of the same family as the heron, which lives in fens or marshy districts, and is remarkable for its booming call. Once common in the eastern counties of England, it became very rare, but now is increasing in numbers.

BITUMEN, a semi-liquid or plastic substance, also called pitch, composed chiefly of carbon and hydrogen. In Trinidad there is a large lake of natural bitumen, from which the material is exported in large quantities.

BLACKCOCK, or BLACK GAME, is a large species of grouse found in Scotland and northern England. The first name applies especially to the male bird, which has much darker plumage than the female —termed Greyhen by sportsmen.

BLACK DEATH is the name given to a terrible plague which ravaged Asia and Europe during the middle decades of the fourteenth century, and swept off from a quarter to a half of the population.

BLACK HOLE OF CALCUTTA, a chamber less than 20 feet square in which on June 20, 1756, 146 English prisoners were confined by Sarajah Dowlah. During the night following all but 23 died from exhaustion and the lack of fresh air.

BLAST FURNACE, a tall, circular chamber in which iron is smelted from the ore. From a cylindrical part, called the hearth, at the bottom, the furnace expands gradually to a point about one-third of its height from the base, and thence contracts towards the top, which is closed by a movable bell. Highly heated air is blown in at many points above the hearth; and charges of ore, coke and limestone are fed in periodically through the top. The intense heat generated causes the iron to melt out and collect in the hearth, from which it is "tapped" at regular intervals into moulds in an adjacent bed of sand, where it solidifies as pig-iron. The slag is drawn off at a higher level and removed to slag-heaps, while the gases coming off are led through purifiers and used for heating the blast air, or for heating steam boilers or as fuel for gas-engines.

BLEACHING, the process of whitening textile fabrics and other materials. Linen is bleached by exposure to sunlight; cotton and paper pulp by chloride of lime; silk and wool by peroxide of hydrogen.

BLOCKADE is the act of preventing an enemy country communicating with the outside world, especially by sea, in order to cut off supplies and cause surrender.

BLOCK SYSTEM is the principle of dividing a railway track into sections or blocks, each of which is protected by signals, operated in such a way as to prevent a train entering a section in which there is a train already. It may be worked by signalmen in electrical communication with each other, or automatically by the trains themselves.

BLOOD is the red fluid which circulates through the heart, arteries, veins and lungs of a living body. It has two main functions: that of conveying nutriment from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the stomach to all parts of the body, and that of carrying oxygen to the muscles from the lungs. Blood is made up of water (about 79 per cent) and various mineral phosphates and chlorides and contains free cells known as the red and white corpuscles.

BLOODY ASSIZE, the series of special sessions held in Somersetshire, Devon and Cornwall by Chief Justice Jeffreys after the Battle of Sedgemoor in 1685, to try persons who had taken part in the Monmouth Rebellion. It gets its name from the great severity shown towards the prisoners, over 300 of whom were condemned to death.

BLUE BOOKS.—Official reports of parliamentary and other matters issued by order of the British Government. The term applies, strictly, to those bound in blue paper covers, but is also used in a wider sense to include publications not so bound.

BLUE-COAT SCHOOL.—*See* CHRIST'S HOSPITAL.

BLUE GUM.—An Australian tree of the eucalyptus family, which sometimes attains a height of 350 feet. The wood is hard, heavy and very durable.

BLUE PETER.—A blue flag with a white square in the centre, hoisted when a ship is about to sail.

BLUE RIBBON, worn by Knights of the Garter, the chief order of chivalry, has come to mean metaphorically what is most worth striving after in any particular sphere of activity. Winning the Derby is the blue ribbon of horseracing; attaining to the Lord Chancellorship that of the legal profession. At various times the *Mauretania*, the *Bremen*, the *Europa*, the *Rex*, the *Normandie* and the *Queen Mary* held the blue ribbon of the Atlantic.

BOA.—A genus of very large non-venomous S. American snakes which kill their prey by squeezing. They are closely related to the anaconda and pythons.

BOARD OF TRADE is the name of the Government Department which handles matters concerned with the trade and industries of the country, administers laws relating to shipping, joint stock companies, mines, quarries, patents and trade marks. It also controls the lighting of the coasts and the coastguard service.

BODLEIAN LIBRARY, the famous library of the University of Oxford, was founded in 1598 by Sir Thomas Bodley, with a large gift of books. It is one of the six British libraries to which a copy of every new book published must be sent. Its contents include a wonderful collection of old manuscripts.

BOER WARS.—The first Boer War, in 1880-81, between England and the Transvaal was a small affair, but somewhat disastrous to British prestige, as it compelled Britain to recognize the Transvaal as a practically independent State. The second Boer War, commonly called the South African War, lasted from October 10, 1899, to May 14, 1902, and, in point of number of troops required from her, was the most serious conflict in which Britain had yet taken part. Before the Transvaal and Orange Free State were overcome more than 350,000 men had been shipped from Britain and the Dominions to South Africa. Under the leaderships successively of General Sir Redvers Buller, Lord Roberts and Lord Kitchener, the Boers were gradually driven northwards and compelled to surrender. The war resulted in the two enemy States becoming part of the British Empire and, later, of the Union of South Africa.

BOILER, a large iron or steel vessel in which a liquid is heated to boiling-point. The steam boiler, built up of steel plates and steel or copper tubes, is totally enclosed, in order that steam may be generated in it under pressure. Some of the most modern steam boilers are designed to stand a working pressure of up to 700 lb. per square inch.

BOILING-POINT of a liquid is the temperature at which it begins to vaporize quickly. It varies with pressure. Water at sea level boils at an average temperature of 212° F. At the summit of a high mountain, where the air pressure is less, its boiling-point is considerably lower, and the difference in temperature affords an accurate indication of altitude. In a steam boiler, boiling-point rises with rise of pressure. The boiling-points of certain substances are so low that these substances occur naturally only in their gaseous state, and are known as gases. They can be reduced to liquid form by intense cold.

BOLSHEVISM, the political policy of the Bolshevik, or revolutionary party, which under Lenin (1870-1924) obtained control of Russian affairs in 1918. It is Communism applied on a large scale to the production and distribution of the necessaries of life. The word is used in a looser sense to signify political violence aiming at the destruction of the general order of things.

BOOK OF THE DEAD, a collection of ancient Egyptian prayers, copies of which were placed in tombs to protect the dead against evil spirits and assist them into the future world.

BOOMERANG, a curved throwing-stick used by Australian aborigines when hunting. It is flat on one side, rounded on the other, and has sharp edges. A skilled user can make the stick return to him in the air if it strikes nothing. It can also be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

used as an amusing toy in various materials.

BORAX, a colourless crystalline substance which is a chemical combination of boron, sodium, oxygen and hydrogen. Used as a flux in soldering, as an antiseptic, and in the manufacture of glazes for pottery.

BOTANY, the science of plant life, is a branch of biology.

BOUNTY, H.M.S., a British ship sent by the British Government to Tahiti in 1787, under the command of Lieut. William Bligh, to transport bread-fruit trees from that island to Jamaica. The crew mutinied during the return voyage, cast Bligh and those loyal to him adrift in a boat, and went back to Tahiti. Later on, some of the mutineers sailed to Pitcairn Island and colonized it.

BOW BELLS were the bells in the steeple of the church of St. Mary-le-Bow, Cheapside. Anyone born within hearing of them may claim to be a "Cockney" or true Londoner. According to a well-known tradition, it was these bells which called Dick Whittington back to London.

BOX, a small-leaved evergreen tree, the hard yellow wood of which is used for wood engravings, tool handles and musical instruments. Dwarf box is grown as a garden edging.

BOXERS, an anti-foreign Chinese society which in 1900 massacred many missionaries and native Christians, killed the German minister, and besieged the British Legation at Pekin. A joint expedition of English, French, German, Russian, American and Japanese forces defeated the Boxers and relieved the legations. The peace signed in 1901 exacted a heavy indemnity from China.

BOYCOTTING is an organized cutting off of a person or firm from commercial or social dealings with others. The word perpetuates the name of an Irish land agent, Captain C. C. Boycott, whose neighbours, at the instigation of the Land League, prevented any work being done on the estate under his care, and would have nothing to do with him socially.

BOY SCOUTS, a movement set on foot in 1908 by Sir R. S. S. Baden-Powell (later Lord Baden-Powell of Gilwell) with the object of developing manliness, high character, self-resource and good citizenship in boys. The Boy Scouts Association was soon afterwards incorporated by Royal Charter. The idea behind the movement at once "caught on," and scouting quickly spread to all parts of the civilized world. There are now well over 3,500,000 Scouts. British Scouts are divided into three grades: Rovers, or seniors; Scouts; and Wolf Cubs, or juniors. (See GIRL GUIDES.)

There is also a marine branch, the Sea Scouts. The Chief Scout is Lord Rowallan.

BRAHMINISM, the worship of a divine trinity, Brahma, Vishnu and Siva, is the old religion of the Hindus. In course of time it has been overlaid with polytheism and become the Hinduism of today.

BRAILLE, a form of printing which may be read by blind people through the sense of touch, invented in 1829 by Louis Braille, a blind Frenchman. The Braille alphabet consists of from one to five raised points or dots, embossed in the paper and arranged differently for different letters.

BRAKES are devices for arresting or controlling movement by friction or hydraulic or electrical resistance. Friction brakes are most commonly used, those on road vehicles being applied by means of levers worked by the hand or foot, and train brakes by the pressure of air.

BRANDING, or marking with a hot iron, was a common form of punishment in earlier times, and did not disappear completely from England till the nineteenth century. The custom of branding slaves on the palm with their owner's initials lasted in the United States till the abolition of slavery. Branding is now confined to the marking of cattle on large ranches, and of wooden articles such as tools and packing cases.

BRASS is ordinarily a yellow alloy of from 66 to 70 parts of copper with from 34 to 30 parts of zinc. It is more easily cast and tooled than copper; but, like copper, takes a beautiful polish. Special brasses contain small quantities of tin, lead, iron, or manganese.

BRAZIL-NUTS, the seeds of the fruit of a large tree native to the northern parts of S. America. From one to two dozen nuts are enclosed in a large hollow shell.

BREAD-FRUIT is the fruit of a tree native to the E. Indies and South Sea islands. It is 5 or 6 inches in diameter, and when cooked is a substitute for bread.

BREAKWATERS are long walls or mounds of stone built up from the sea-bottom to form or protect harbours. Those at Dover Harbour are composed of huge concrete blocks, weighing up to 50 tons apiece, arranged like bricks and keyed together. Plymouth breakwater is an example of breakwaters formed by dumping vast quantities of stone and allowing the stones to arrange themselves at a stable angle. In some cases, as at Portland, a mound of stones is capped by a stone wall: and in others a stone core is faced on the seaward side with large concrete blocks tipped haphazard. When the Allies landed in France in 1944, breakwaters built in Britain formed part of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

prefabricated ports that made the attempt possible.

BRETTON WOODS AGREEMENT arose out of the International Monetary Conference held in New Hampshire, U.S.A., in 1944. It was attended by representatives of the United Nations, who agreed to the establishment of a currency fund to promote exchange stability after the cessation of hostilities. This was subject to ratification by the 44 Governments concerned.

BREVIARY, a prayer-book used daily by the Roman Catholic clergy. It is divided into four parts, one for each season of the year; and has been in use—with revisions—for over 700 years.

BRICKS are rectangular masses of clay that have been shaped in moulds and hardened by heating in a pile (called a "clamp") or a kiln. The ordinary dimensions of an English brick are: length, 9 in.; width, 4½ in.; thickness, 3 in. Bricks are made either by hand or by machine. Some varieties have "frogs," or hollows, on the wide faces; others are flat on all surfaces. The colour, toughness and other qualities of a brick depend on the contents of the clay and the heat used in "burning" or firing. Brick clay contains alumina, silica, iron, lime and manganese, occurring together naturally or mixed artificially. When the clay has been well worked up in a mill it is moulded, and the raw bricks are stacked in the open air to dry. They are then either burned in a kiln—in principle a large oven—or stacked up in clamps, in which passages are left for hot gases from the furnace enclosed by the pile.

BRIDGES are structures of brick, stone or metal for spanning depressions in the ground, rivers or other stretches of water. They may be subdivided into arched bridges, girder bridges, suspension bridges and movable bridges. *Arched* bridges consist of one or more arches, usually of stone or bricks, but, where great distances have to be spanned, of steel. The largest metal arch bridge is the Bayonne Bridge, New Jersey, with a central span of 1,675 feet. *Girder* bridges, having their girders resting at each end on vertical supports, include cantilever bridges, built out on each side of central towers till the girders meet. A leading example of the cantilever bridge is the Forth Bridge, with two main spans of 1,700 feet. Suspension bridges have a single main span, hung from huge chains or, more commonly, from cables composed of a great number of parallel steel wires clamped together. By far the largest bridge of this type is the Golden Gate Bridge at San Francisco, with a span of 4,200 feet. Movable bridges include the revolving bridge, which turns horizontally; the bascule bridge, with leaves which revolve vertically—for example, the Tower Bridge, London; and the rolling bridge, with girders which roll back and rise vertically on semi-circular ends.

BRITANNIA METAL is an alloy of tin, antimony and, in some cases, small proportions of copper, lead or zinc. It is hard, takes a good polish, and can be electro-plated. Used for table-ware.

BRITISH ASSOCIATION.—This is the leading British scientific association. Its full title is "The British Association for the Advancement of Science." Founded in 1831, it now has several thousand members. It is subdivided into a number of sections, each concerned with one particular branch of science. A meeting of the Association is held every year in some important town, and at it papers are read by members.

BRITISH BROADCASTING CORPORATION, popularly known as the "B.B.C.," was instituted in 1927, to succeed the British Broadcasting Company, whose five years' licence expired in that year. Subject to the Government, it controls the broadcasting of programmes in Great Britain and Northern Ireland. Its revenue is derived from wireless licences, the proceeds of which it shares with the Post Office and Treasury, and it is not a profit-making enterprise. The headquarters of the B.B.C. are Broadcasting House, a huge building in Portland Place, London. It operates broadcasting stations in various parts of the country including Brookman's Park, Huddersfield, Daventry, Bournemouth, Droitwich, Newcastle, Plymouth, Cardiff, Swansea, Aberdeen, Dundee, Edinburgh, Glasgow and Belfast.

BRITISH EMPIRE, or the Commonwealth of Nations, is the name commonly given to the territories which give allegiance to the British Crown. Its history starts with the occupation of Newfoundland and Virginia in the latter part of the sixteenth century. In 1939 it occupied about 121,000 sq. miles in Europe; 1,800,000 sq. miles in Asia; 4,600,000 sq. miles in Africa; 4,000,000 sq. miles in the New World; and 3,300,000 sq. miles in Oceania—totalling about one-quarter of the land area of the globe, inhabited by about the same proportion of the human race—450,000,000.

BRITISH LEGION, an organization instituted in 1921 by the late Earl Haig of Bemersyde, to assist ex-servicemen and their families. Its funds are derived largely from the sale of poppies on Armistice Day. The Legion has several thousand branches in Britain and over-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

seas. Attached to it is an Auxiliary Women's Section.

BRITISH MUSEUM, now the greatest of the world's museums, was inaugurated in 1759, at Montague House, Bloomsbury, with collections purchased from the estate of Sir Hans Sloane, and the Harleian collection of MSS. Successive bequests and purchases made it necessary to extend the accommodation, and Montague House was modified and added to during the period 1823 to 1847 until the Museum had assumed its present general exterior form. In 1857 the great circular Reading Room in the centre of the building was opened; in 1881 the natural history collections were removed to a new branch building in South Kensington; and during the first decade of this century large additions were made to the north side of the Museum. It now includes one of the greatest of libraries and priceless collections of antiquities, coins, gems, manuscripts, autograph letters and other objects of value and interest.

BRONZE, in the strictest sense of the term, is an alloy of from 80-95 parts of copper with 20-5 parts of tin. Gun-metal is bronze containing 90 per cent of copper; the bronze used for coinage is 95 per cent copper; bronze for bells is 80 per cent copper. Special bronzes for engineering purposes contain small quantities of zinc, phosphorus, aluminium, or nickel. The earliest metal tools and weapons were made of bronze; and the period during which they were used is spoken of as the Bronze Age of a race. Since the earliest days of civilization bronze has been employed in the casting of statues and other objects of art.

BUCCANEERS, a term applied originally to white cattle-hunters in the W. Indies, came later to signify the European filibusters or pirates who preyed on Spanish shipping and possessions in the New World during the seventeenth century. Their most notable leader was Henry Morgan, a Welshman, who sacked Panama in 1671, and was afterwards appointed Governor of Jamaica.

BUCKINGHAM PALACE, now the London residence of the Sovereign, is a mansion built by the Duke of Buckingham in 1703, bought by George III in 1763, and remodelled for George IV by Nash. Queen Victoria was the first sovereign to make regular use of it when in London.

BUDDHISM, the religious faith promulgated by Gautama, or Buddha, a Hindu ascetic, in India during the sixth century B.C., is a philosophy rather than a religion. It recognizes no gods, and regards self-suppression, kindness and purity as virtues to be diligently pursued until the devotee has qualified to enter Nirvana, a state in which personality disappears. Driven from India by Brahminism, Buddhism spread to Ceylon, Malaya, Tibet, China and Japan, and now is accepted by over 500,000,000 human beings, though in many districts debased by idolatry and magic. The Grand Lama of Lhasa, Tibet, is the head of Mongolian Buddhism.

BUFFALO, a large animal of the ox family, found in Asia and Africa. There are several species; the Indian can be domesticated, and is used as a draught animal; the African is a very formidable creature, and one of the most dangerous animals to hunt.

BUILDING SOCIETIES are associations incorporated (for the most part) under various Building Societies' Acts with the object of enabling persons to become possessed of houses and other freehold property by paying for them in instalments through the medium of mortgages. There are over 1,000 of such societies in Great Britain, with more than 2,000,000 investors and assets of £876,000,000.

CABINET, the Council composed of the principal members of the British Government, selected and presided over by the Prime Minister. Meetings of the Cabinet are called Cabinet Councils, and members of the Cabinet are known as Cabinet ministers, to distinguish them from members of the Government who are not of Cabinet rank.

CACAO, a tropical tree cultivated in the W. Indies, W. Africa, Ceylon and elsewhere, the large pods of which contain the seeds or nibs from which cocoa and chocolate are made. Its botanical name is *Theobroma cacao.*

CACHALOT, or SPERM WHALE, one of the largest of the toothed whales. In its huge head is a cavity containing up to 900 gallons of oil, from which a wax called spermaceti is derived.

CACTUS, a desert plant of the New World, with large, fleshy leaves covered, like the stem, with prickles. Some species bear brilliant flowers, and most store water in their stems and leaves.

CAFFEINE, an alkaloid, crystalline substance which gives coffee, tea and cocoa their stimulating qualities. Also known as theine (in tea) and is similar to theobromine (in cocoa).

CALCIUM, a white, light metal, one of the elements, existing in great quantities in combination with other substances. Chalk, limestone and marble are carbonates of calcium; gypsum is sulphate of calcium.

CALCULATING MACHINES are devices which add, subtract, multiply or divide figures, or perform other mathematical operations. They are usually

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

operated by keys like those of a typewriter. Many cash-registers include adding mechanism which keeps a running total of all sums paid in. In many banks calculating machines now do much of the work formerly done with pen and ink.

CALENDAR, the method of numbering years, and of subdividing a year. Our calendar is based on the Roman calendar, which reckoned a year as the time taken for the earth to make a complete circuit of the sun. The Roman calendar year originally contained only 10 months. Numa added January and February. The year began with March, which accounts for the now misleading names of September, October, November and December. Julius Cæsar fixed its length at 365 days, with an extra day added every fourth year (leap year) to keep this right with solar time. But the year, even so, was 11 minutes too long, and in the course of centuries the calendar got steadily behind the sun. In 1582, Pope Gregory XIII straightened matters out by introducing a new calendar by cutting out 10 days in October, and giving 1583 a correct start. This principle was adopted by Britain in 1752, when September was shortened by 11 days. To prevent the error accumulating again, only every fourth end-century year is now reckoned a leap year: that is, only those century years such as 1600, 2000, which are divisible by 400. As regards numbering of the years, the Greeks reckoned from the first year in which Olympic games were held, and the Romans from the supposed date of the founding of Rome. The Christian calendar starts from the birth-year of Christ, and the Mohammedan from the Hegira, or flight of Mahomet to Medina, in the 622nd year of the Christian era. (*See* YEAR.)

CALENDERING, rolling paper, fabrics, etc., under great pressure to give them a gloss. In laundries, calendering with steam-heated rollers is a substitute for ironing in the case of large articles, such as sheets and tablecloths.

CALENDS, or KALENDS, the first day of a Roman month. Postponement of an act till the "Greek Calends" signified that it would never be carried out, as the Greeks did not use the word in their calendar.

CALICO, cotton cloth, is named after Calicut, in India, whence it was first imported into Europe during the fifteenth century.

CALUMET, the tobacco pipe, the "pipe of peace," smoked in turn by all the warriors of a Red Indian council or peace meeting.

CAMBRIDGE UNIVERSITY, one of the two senior universities of England, dates from the thirteenth century. The oldest of its 18 colleges for men is Peterhouse, founded in 1284; the newest, Selwyn (1882); and the largest, Trinity. It includes two colleges for women, Girton and Newnham; and has over 6,000 undergraduates in residence.

CAMEL, a long-necked, grass-eating animal, with large, padded feet and a hump, or two humps, on its back. It is doubtful whether any truly wild camels now exist, the animal having been domesticated and used as a beast of burden in Arabia, Persia, Asia Minor and N. Africa for many centuries. Its large feet enable it to travel easily over sand; and the stores of water carried in its peculiarly formed stomach, and of reserve food in its fat hump or humps, allow it to travel several days on end without food or drink. The camel is very fitly named "the ship of the desert."

CAMOMILE, a wild perennial plant, the bitter flowers of which are used in medicine.

CAMORRA, an Italian secret society, with headquarters at Naples, and composed originally largely of criminals, which during the nineteenth century exercised considerable political power through terrorism. It was severely dealt with by the Italian Government in 1902-1911, and finally suppressed by the Fascists.

CAMPANILE, a lofty bell-tower, in many cases separate from the church to which it belongs. The most famous campaniles are in Italy, where they originated: at Florence, Pisa (the Leaning Tower), Bologna, Milan and Venice (St. Mark's). The last collapsed in 1902, but was rebuilt at a cost of over £80,000. The campanile of Westminster Cathedral is over 270 feet high.

CANAL, an artificial waterway constructed to carry boats or ships, or to convey water for irrigation, drainage, or power purposes. The earliest canals were irrigation canals in China and Mesopotamia. To use them also for navigation was a natural development. During the eighteenth century there was an enormous extension of *barge canals* in England, to expedite and cheapen transport; but after the coming of railways many of them fell into disuse, and the traffic on the rest declined greatly, with few exceptions. *Ship canals* enable large vessels to pass through land from sea to sea, or to reach an inland city. Most of those now in existence—the Suez, Amsterdam, Corinth, Cronstadt, Kiel, Manchester and Panama, for example—have been made since 1860.

CANONIZATION is the process of adding the name of a dead person of great saintliness of life to the canon, or list, of Saints of the Roman Church. Except in very special cases a period of at least 50

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

years must elapse between death and canonization, which is preceded by a very close scrutiny of the deceased's character and doings. (*See* ADVOCATUS DIABOLI.)

CAPITOL, a hill in Rome on which the early kings built a splendid temple to Jupiter. On the same eminence was the ancient citadel of Rome.

CAPUCHINS, a branch of the Franciscan friars. The name is derived from the hood or cowl worn by the members.

CARBOHYDRATES are certain chemical compounds of carbon, hydrogen and oxygen. They include many substances which are valuable foods—sugar and starch, for example; and others of great commercial importance, such as cellulose and glucose. Almost all are of vegetable origin.

CARBOLIC ACID, a very poisonous and corrosive liquid derived from coal tar, valuable as a disinfectant, and, much diluted, as an antiseptic lotion for wounds.

CARBON, a very widely distributed element, occurs naturally in the pure state as graphite and diamond; and impure, as coal. Combined with other elements, it forms carbonates, carbohydrates and hydrocarbons. It occurs in all organic or living matter, and in all foods. When combining completely with oxygen, or "burning," it generates heat.

CARBONIC ACID, or CARBON DIOXIDE, is a gas of which each molecule contains one atom of carbon and two atoms of oxygen. It is formed whenever carbon is burned; and in the body by the combination of food carbon with oxygen. The blood is freed from it by the lungs. Though not poisonous, it is suffocating to animals, as the lungs cannot make use of the oxygen in it; but it supplies trees and plants with carbon.

CARBON MONOXIDE, a very poisonous gas formed by the imperfect combustion of carbon. This gas is the dangerous element of the exhaust gases from a motor car, and is a deadly after-effect of coal-mine explosions.

CARBUNCLE, a garnet of a deep red colour, obtained from Brazil, Burma and Ceylon. It is far less valuable than the ruby, which it somewhat resembles.

CARMELITES, or WHITE FRIARS, an order of friars founded on Mt. Carmel, Palestine, in the 12th century. Several Carmelite communities still exist in England

CARNIVAL, a time of gay revelry, originally that which occupied the last few days before Lent. The word means "the putting away of flesh," which followed when Lent began. Nowadays the word has a much wider application, covering festivals accompanied by decoration with flags, fancy dresses and processions.

CARPETS are thick, and often ornamental, coverings for floors. They came to Europe from the East, whence still come —from India and Persia—some of the finest examples. The industry of carpet-making was introduced into England in the eighteenth century. Pileless carpets are made chiefly at Kidderminster; long-pile, or Brussels, carpets at Axminster.

CARTEL, an agreement for modifying unlimited competition by keeping up prices, the division of markets, the amalgamation of firms into combines or trusts, and other means usually of a monopolist character. Many plans of this nature were carried out under the name of industrial nationalization.

CARTHUSIANS, a religious brotherhood founded at Chartreuse, in France, by St. Bruno in 1086. A community of Carthusians built a monastery in London on the site where the more modern Charterhouse now stands.

CARTOON, primarily a full-sized design on paper for a fresco, tapestry, or picture. Now commonly used as an illustration of a satirical or humorous character in a journal. The political cartoons of *Punch* are world famous.

CASEIN.—A constituent of milk which does not enter into butter, but is retained in cheese. It is used in industry for the manufacture of certain plastics.

CASSANDRA, one of the daughters of Priam, King of Troy, who was a prophetess doomed to have her prophecies of coming disaster disbelieved.

CASSOWARY, a large bird of the same family as the ostrich, found in Australia, New Guinea and neighbouring islands. It stands about five feet high; is unable to fly, but is a powerful runner.

CASTE, one of the social classes into which Hindus are divided. A Hindu belongs to the caste of his father, and cannot rise from it. There are many castes, of which the priestly caste is the highest of all, and the untouchable caste the lowest.

CASTOR OIL is an oil obtained from the seeds of a tropical tree, *Ricinus communis.* It is a strong purgative, and has various commercial uses.

CAT, the name of a family of carnivorous quadrupeds with formidable teeth and claws, and long, lithe bodies. These include lions, tigers, leopards, jaguars, pumas, lynxes, wild cats and domestic cats. The last may be divided into long-haired, or Persian, cats; and short-haired, which are believed to have come originally from Egypt.

CATACOMBS, underground burial places, consisting of passages flanked by niches in which the bodies of the dead were placed. The most famous are those at

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rome, made and used by the Christians during the first four centuries A.D. Together, they cover an area of about a square mile and contain several hundred miles of galleries.

CATAPULT, an ancient engine of war used for hurling flights of heavy darts or javelins. The modern catapult, for killing birds and small game, consists of a forked stick, two lengths of indiarubber cord, and a pouch for holding the projectile, and is very destructive in skilful hands.

CATECHISM, a form of instruction, consisting of a series of questions and answers. It need not necessarily have a religious character, though the word is most commonly associated with religious teaching. The Church Catechism is one of the things which a candidate for confirmation is required to learn.

CAVALIER, originally one who could afford a horse (French, *cheval*) to ride on; hence a knight or gentleman; but popularly used of a supporter of Charles I in the Civil Wars who wore his hair long and dressed somewhat extravagantly.

CAVIARE, the dried and salted roe of the sturgeon and other large fish, esteemed as a delicacy.

CAYENNE PEPPER is the ground-up seed-pods of certain Asiatic and S. American plants, called capsicums or chillies.

CEDARS, a genus of beautiful cone-bearing trees. They include the cedar of Lebanon, with wide-spreading branches, grown in many large gardens; and the pencil cedar, from the wood of which the cases of lead-pencils are made.

CELLULOID, or XYLONITE, is made by dissolving nitrate of cellulose in camphor, kneading the material between steam-heated rollers, and compressing it by hydraulic pressure. It can be given any required colour by the addition of dyes, and is easily moulded when warmed. It is used for the backing of photographic films, and for a large variety of fancy and other articles. Dissolved in acetone it makes a quick-drying, hard varnish.

CELLULOSE, the fibrous and chief constituent of vegetable tissues. Cotton-wool is an example of practically pure cellulose. Treated with nitric and sulphuric acids, it yields the powerful explosive called gun-cotton. Cellulose derived from wood is now used in great quantities for the manufacture of artificial silk. (*See* RAYON.)

CELTS, a race which, when first known in history, occupied France, whence it spread to Britain, Spain, Belgium, Italy and Eastern Europe. It is now represented by the Bretons, the Welsh, the Highlanders of Scotland and part of the population of Ireland, all of whom have retained the Celtic language in more or less modified forms. The English race as a whole has a Celtic strain, most noticeable in the north and west, especially in Cornwall.

CEMENT, PORTLAND, a mixture of aluminous clay and chalk or lime, reduced with water to the state of mud, burnt in a kiln, and ground to a very fine powder. This, when wetted, sets very hard and is practically imperishable. Mixed with sand it makes a very valuable mortar; and, with sand and broken stone or other hard material, concrete.

CENOTAPH is a Greek-derived word signifying an empty tomb. To Britons *the* Cenotaph is the monument in Whitehall raised in memory of those who fell in the Great War, and unveiled on Armistice Day (Nov. 11), 1920, by H.M. King George V.

CENSUS, the numbering of the whole population of a country on the same day. It is taken in the first year of each decade in Great Britain. The forms that every householder has to fill up give, collectively, information about average length of life, density of population in various districts, movements of population, occupations and other important matters. The census of 1931 showed the population of England, Scotland and Wales to be 44,790,485.

CENTAURS, a race of monsters in Greek mythology, represented in sculpture as having the body and legs of a horse, and the body, arms and head of a man.

CENTRE OF GRAVITY, the point, in a mass or body, round which it balances in all directions. The "c.g." of a circular body is its centre. If a vertical body, such as a column, is tilted until its c.g. is vertically outside its base, it tends to fall over.

CERBERUS, the many-headed dog which, according to Greek mythology, guarded the entrance to Hades. Hercules chained it and brought it to earth.

CERIUM, a metallic element, the oxide of which is an end product in the manufacture of incandescent gas mantles.

CETACEA, the order of marine mammals which includes the whales, porpoises and dolphins. All are warm-blooded, breathe atmospheric air, and have a thick layer of blubber immediately under the skin.

CHALK is a very pure form of granular limestone, consisting partly of the shells of tiny marine creatures deposited in remote ages on a sea-bed, which in many cases has been overlaid by other strata, and in others raised above sea level before being covered, as along the south coast of Kent.

CHAMBERLAIN, a high official of a court or corporation. The Lord Great Chamberlain is an hereditary officer of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

state, who attends the sovereign on great state occasions. The sovereign's household is under the control of the Lord Chamberlain. The Chamberlain of the City of London acts as treasurer and has judicial and administrative duties.

CHAMELEON, a lizard well known for its ability to change its colour to suit that of its surroundings. It has an extraordinarily long tongue, which it darts out to catch insects.

CHAMOIS, a goat-antelope which inhabits the wilder parts of the Swiss Alps and other European ranges. Very little so-called chamois leather is made from its skin.

CHAMPAGNE, a white, sparkling wine made from grapes grown in the Champagne district of France, which includes the departments of Marne, Haute-Marne, Aube, Seine-et-Marne and Yonne. It is stored for several years in cellars—many of them caves—before being put on the market.

CHANCELLOR, LORD, the chief legal officer of state, Keeper of the Great Seal, and Speaker of the House of Lords. He takes precedence next after the Archbishop of Canterbury.

CHANCELLOR OF THE EXCHEQUER, one of the heads of the Treasury, and a Cabinet Minister. His duties are to present to Parliament a statement, called the Budget, of how he proposes to raise sufficient revenue to meet the national financial needs in the coming financial year, and how it is to be spent; and, if the Budget is passed, to arrange for the collection of revenue.

CHARCOAL is obtained by heating wood until all moisture and gaseous matter have been driven off and only carbon remains. Previously to the use of coal for the purpose, it as used as fuel in the smelting of metals. Nowadays it is employed chiefly in filters, in the manufacture of gunpowder, and as an insulator of refrigerated chambers.

CHARON, a god of Greek mythology, who ferried the souls of the dead across the rivers (especially the Styx) of the lower world. Represented as an old man in tattered garments. Every passenger had to pay him a fare, so a coin was placed in the mouth of a dead person before burial.

CHARTERHOUSE SCHOOL, one of the leading English public schools, was originally in Charterhouse Square, London, whence it was transferred in 1872 to its present site at Godalming, Surrey. Members of the school go under the name of Carthusians.

CHARTISM, a popular movement in the fourth and fifth decades of the nineteenth century among the English working classes which aimed at political reforms in the suffrage, and, in its later stages, had a strongly socialistic character. It culminated in 1848, when a gigantic petition was to be presented to Parliament by a procession of half a million Chartists, summoned to assemble on Kennington Common. The procession was forbidden, the meeting proved a complete failure, and the movement died out soon afterwards.

CHAUVINISM, an excessive patriotism, the French equivalent of British "Jingoism." Named after Nicolas Chauvin, a devoted follower of Napoleon I.

CHEETAH, a large animal of the cat family, found in S. Asia and Africa. It is also called the hunting leopard, as it is spotted like a leopard and has long been used in India and Persia for hunting game. Over a short distance it is regarded as the swiftest of all quadrupeds.

CHELTENHAM COLLEGE, one of the chief English public schools for boys, was founded in 1841. Cheltenham Ladies' College, for girls, was established in 1854, and has nearly 800 pupils.

CHEMISTRY is the science which examines the composition and qualities of all kinds of matter. It is divided into two branches: *organic* chemistry, dealing with the combinations of carbon; and *inorganic*, confined to substances not endowed with life.

CHEQUERS is the name of a mansion in Buckinghamshire which in 1917 was presented to the nation by Lord and Lady Lee of Fareham, to be the official country residence of the Prime Minister of the day.

CHESTNUT, a handsome forest tree, two species of which grow in Britain—the horse chestnut, and the sweet, or Spanish, chestnut. The first is notable for its beautiful pink or white blossom-spikes; the second yields edible nuts, and has a rough bark with spiral flutings. Chestnut wood is extremely durable.

CHICORY, or ENDIVE, a large-leaved plant grown in kitchen gardens as a salad. The dried and roasted root, ground to powder, is sometimes mixed with coffee.

CHILTERN HUNDREDS, a district of the Chiltern Hills, in Buckinghamshire. If a member of the House of Commons wishes to retire, he may not resign: but, by accepting the stewardship of the Chiltern Hundreds, which carries a nominal salary of £1 per annum, he automatically vacates his seat, as now holding "an office of profit under the Crown."

CHIMPANZEE, an anthropoid ape found in Equatorial Africa. It is highly intelligent and, as shown by specimens at the London "Zoo," can be trained to use a cup, knife and fork at its meals.

CHLORINE, a greenish-yellow, suffocating gas, one of the elements. It unites

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with other elements to form chlorides, chlorates and chlorites. Common salt is sodium chloride; bleaching powder, chloride of lime.

CHLOROFORM, a liquid combination of chlorine, carbon and hydrogen, was discovered by Liebig in 1832. The vapour from it was first used as an anæsthetic by Sir James Simpson, in 1847, at Edinburgh.

CHOCOLATE, cocoa deprived of some of its fat, pulverized and mixed with sugar and, in some cases, other flavouring matter. It was introduced from Mexico about 1524.

CHOUGH, a member of the crow family, distinguished by its red beak, legs and feet. It is smaller than a rook or crow, but has a glossier plumage. Now rare, and confined to rocky districts near the sea.

CHRISTIAN SCIENCE, the interpretation of the Christian religion evolved and founded by Mary Baker Eddy in 1866. Its followers regard it as the restoration and divinely promised fulfilment of the religion taught and practised by Christ Jesus: "the law of God, the law of good, interpreting and demonstrating the divine Principle and rule of universal harmony."

CHRIST'S HOSPITAL, or the Blue-coat School, was originally an institution for orphans, occupying the Grey Friars House in Newgate Street, London. It developed into a school for the sons of poor freemen of the City, clergy and military officers. In 1902 the school was transferred to new buildings at Horsham, Sussex; and four years later a new school for girls was opened at Hertford. The boys still wear the old dress—a long blue coat, breeches and yellow stockings, and go hatless.

CHROMIUM, a hard greyish metal, one of the elements, used in the manufacture of special steels, one of which is known as stainless steel: Its chemical compounds include chrome-alum (used in tanning) and bichromate of potassium.

CHURCH ARMY, an institution founded in 1882 by Prebendary Wilson Carlile to assist the workless and homeless by providing work and lodging, and generally to help those in want and distress. It administers a large number of homes and employment agencies, and sends mission vans through the country.

CHURCH OF ENGLAND, the first Christian Church to be organized in England, by Archbishop Theodore in 673. Until the Reformation it was under the jurisdiction of Rome, though not so fully as the churches in, say, Spain and France. The breakaway from Rome came in Henry VIII's reign. In 1531 Henry was agreed, by the Convocations of Canterbury and York, to be the supreme head of the Church of England, and the title was confirmed by Parliament in 1531. The final separation came in 1570, when Pius V excommunicated Queen Elizabeth. She reconstituted the Church under Archbishop Parker. Episcopal rule continued, as in the past, and the general organization of the Church remained unaltered, though certain doctrinal changes resulted from the Protestantism of the Reformation.

On account of its long history the Church of England has certain prerogatives, such as representation in the House of Lords, and the conducting of religious ceremonies on State occasions; and as such is known as the "Established" Church. On the other hand, its clergy are excluded from the House of Commons; and it is subject to Parliament as regards important reforms. Contrary to a widespread belief, its endowments do not come from the State.

The term "Anglican Church" covers the Church of England and all other episcopal churches in full communion with it: those of Scotland, Ireland, Canada, Australia, New Zealand, the Protestant Episcopal Church of the United States, etc.

CHURCH OF SCOTLAND.—Until 1560 Roman Catholicism prevailed in Scotland. From that year onwards there was a struggle between Catholicism and Protestantism, which was ended in 1690 by the Scottish Parliament adopting Presbyterianism as the established religion of the country. The Treaty of Union between England and Scotland ratified the decision.

CID, a Spanish noble of the eleventh century, whose real name was Rodrigo Diaz de Bivar. Being banished from Castile, he took service under the Moors, and soon proved himself a doughty warrior. Eventually he established himself as a practically independent ruler at Valencia. As the leading character in a Spanish epic written 40 years after his death, he became the national hero of Spanish legend.

CIDER is the fermented juice of certain varieties of apples. Having been separated from the pulp by squeezing in a press, the raw juice is allowed to ferment for several days, and then drawn off into casks.

CINCHONA, an evergreen tree native to the Andes, from the bark of which quinine is obtained. It is named after the Countess of Cinchon, who introduced the drug into Europe. Now cultivated in the W. and E. Indies, Ceylon and India.

CINEMATOGRAPH, an apparatus for projecting pictures on to a screen in so rapid a succession that objects seem endowed with movement. Cinematographic films are a series of instantaneous photographs taken with a special camera. The shift from picture to picture is so

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

interval between changes, and the illusion of continuous movement results. Ordinarily the rate of projection is about 24 per second. What are called slow-motion films are *taken* at a rate of up to 300 per second, but *projected* at the normal rate, so that movements appear to be slowed down greatly.

The first practical cinematograph was produced by T. A. Edison in 1889. The first public exhibition of cinematographic films took place in New York in 1894. Since then enormous sums have been expended on improving apparatus, organizing special studios for the production of films, and building halls and theatres devoted to the showing of films. The cinematograph now takes first place as a means of public entertainment, and is becoming an increasingly important factor in education. Since 1925 the "silent" film has been largely ousted by the "talking" film, which provides for the reproduction of sounds as well as of objects, and has greatly stimulated the dramatic film. (*See* TALKIES.)

CINNAMON is the dried inner bark of the twigs of an evergreen tree cultivated chiefly in Ceylon. Used as a flavouring and rarely in medicine.

CINQUE PORTS, originally the "five ports" of Sandwich, Dover, Hythe and Romney, in Kent, and Hastings, in Sussex. Winchelsea and Rye were added in the thirteenth century. From the time of Alfred these seaports were accorded special privileges in return for supplying ships to defend the country.

CISTERCIANS, a monastic order allied to the Benedictines, founded at the end of the eleventh century. Spreading rapidly, it had, in Henry VIII's reign, 100 religious houses in England. The Cistercians were great architects and agriculturalists.

CIVIL AVIATION in Great Britain is today largely in the hands of three Government-controlled organizations. These are: 1. British Overseas Airways Corporation (B.O.A.C.), which comprises the old Imperial Airways and British Airways, was formally set up by Act of Parliament on April 1, 1940. B.O.A.C. has a monopoly of long-distance Empire routes, British transatlantic services to North America, and a number of services from Cairo to various parts of Africa and the Near and Middle East. The "Dragon" service between the U.K. and Tokyo was started as far as Iwakuni in March, 1948. 2. British European Airways, operating between Northolt aerodrome and many of the main European capitals. 3. British-South American Airways, operating between the United Kingdom and countries on the east and west coast of Latin America. There are a number of other air-operating companies in addition to the three corporations mentioned above, including Railway Air Services, Channel Island Airways, Great Western and Southern Air Lines (in association with Railway Air Services and Olleys Air Services), Isle of Man Air Services Ltd., West Coast Air Lines, Allied Airways and Scottish Airways.

CIVIL LIST, the sum granted by Parliament to be paid yearly to the sovereign and members of the Royal Family to meet their personal expenses and the upkeep of their households in a manner worthy of their dignity.

CLAY is the general name of those earths, consisting chiefly of silicate of aluminium and finely divided rocky materials, which when wetted are sticky and easily moulded.

CLEOPATRA'S NEEDLE, an Egyptian obelisk which was moved from Egypt to England in 1878 and erected on the Thames Embankment. It is about 70 feet high and weighs nearly 200 tons. The name is misleading, as the Needle is far older than the time of Cleopatra.

CLOCK, an instrument or device for measuring time. The earliest clocks were operated by the inflow of water into, or by its escape from, a vessel. The word now usually applies to a mechanical train driven by a spring or weight, and controlled by a pendulum or balance wheel, which moves hands round a dial at a steady rate. The first clocks of this kind were produced probably in the thirteenth century; but the art of clockmaking was not firmly established till the fourteenth century, to which belongs the famous clock in Wells Cathedral, constructed by Peter Lightfoot, originally for Glastonbury Abbey. Until 1500 all clocks were driven by weights, and till about 1650 were controlled by a device called a verge. The discovery by the famous astronomer Galileo of the laws governing the rate of swing of pendulums led to pendulums being adopted —probably first by Huygens in 1656. Later inventors produced self-compensating pendulums which counteracted automatically changes in length due to alterations in temperature. The balance wheel and hair-spring, patented in 1675 by Thomas Tompion, made possible portable clocks of good time-keeping qualities. Modern developments of horology include the electric clock, either driven or controlled, or both, electrically. What are called synchronome clocks are recording clocks connected electrically with a master clock, with which they all keep perfect time. The latest form of electric clock has the train driven by a tiny induction motor taking current from the public supply

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

 Digitized by Arya Samaj Foundation Chennai and eGangotri

mains. Its particular design compels the motor to run at a constant speed controlled by the number of alternations per second of the current; which in turn is regulated within very narrow limits at the generating station in accordance with time signals.

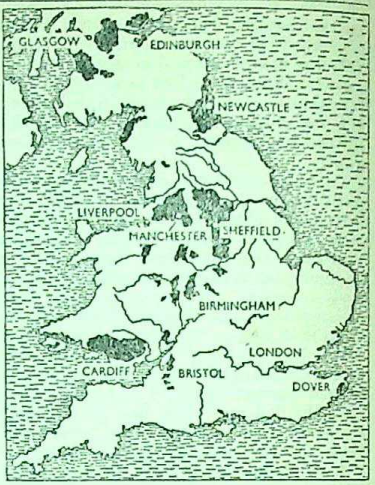
CLOSURE, an arrangement for preventing the obstruction of business in the House of Commons by speeches or discussions of excessive length. It was introduced in 1882, first used in 1885, and modified and extended in 1887 and 1911. When the ordinary closure is moved by any member present and accepted by the majority, the matter before the House or Committee must be voted on. Under the closure it may also be arranged that a discussion shall end automatically at an agreed time; or what amendments shall be discussed.

CLOUDS are masses of water particles suspended in the air. When they descend to ground level they are called fogs or mists. They are caused by the condensation of water vapour by cold currents of air. If a number of particles coalesce into bodies too heavy to float, the water falls as drops of rain. The highest clouds, called cirrus clouds, float at an elevation of about 30,000 feet, where the air is so cold that the particles are frozen into ice. At successively lower levels occur cirro-stratus, cirro-cumulus, strato-cumulus and nimbus clouds. The last are commonly called rain clouds.

CLOVES, the unexpanded, dried flower-buds of an evergreen shrub native to the Molucca Islands, used as a spice and in medicine.

COAL is a black or brownish rock formed from vegetable matter subjected to great pressure and chemical changes during vast periods of time. It consists mainly of carbon, and contains oxygen, hydrogen and various incombustible impurities, such as silica, alumina, sand and clay, which constitute the ashes left by burned coal. Anthracite coal is almost pure carbon. Steam coal is somewhat richer in gases. Bituminous coals give off a large quantity of gas when heated, and as a class are used for the manufacture of coal gas and in domestic heating. Lignite, or brown coal, has comparatively small heating power and burns with a great deal of smoke. Very little of the last is found in the British Isles. Coal occurs as beds or seams in the upper part of the carboniferous system of rocks, separated by layers of shale, sandstone, limestone, etc. Seams vary from a few inches to many feet in thickness.

For centuries coal has been one of the greatest sources of Britain's wealth, owing



Map showing chief coalfields of Great Britain

to its proximity to large deposits of limestone and iron ore, the other two materials needed for the production of iron and steel.

COAL GAS is obtained by heating bituminous coal in chambers, called retorts, until the gas separates from the carbon and certain impurities which remain behind and form what is known as coke. About 15,000 cubic feet of gas comes away from a ton of coal. The gas is sucked from the retorts by a fan through water, condensers, and other apparatus, which rid it of tar and ammonia gas. Sulphuretted hydrogen, a very evil-smelling gas, is removed by passing the coal gas over trays of oxide of iron, which combines greedily with the sulphur. After being dried by contact with calcium chloride, the gas is ready for storing in a gasholder.

Coal gas is in many cases mixed with water gas, made by blowing steam through burning coke. This is "enriched" with the vapour of a heavy mineral oil, which increases its heating power.

The by-products of coal gas manufacture are of great importance. Coke is a valuable fuel. Sulphate of ammonia, a widely-used fertilizer, is made from the ammonia gas; and sulphuric acid from the sulphur. Gas tar is the source of creosote, benzole and hundreds of other substances, including many dyes.

COASTGUARD SERVICE, an organization founded originally to prevent smuggling, but later concerned chiefly with watching for signals from ships in distress and assisting in the rescue of persons on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wrecked vessels. During the Second World War the Service came under the Ministry of Transport, by which it is still controlled.

COBALT, a hard white metal, one of the elements, discovered in 1733. Used chiefly in the manufacture of blue pigments.

COBRA, a large and very venomous snake, distributed over S. Asia and specially over India. It can distend its neck into what is called a hood, on the back of which is a black spectacles-shaped mark.

COCA, a tropical shrub from the leaves of which is derived cocaine, used as a local anaesthetic and stimulant. The habitual taking of cocaine is extremely harmful.

COCHINEAL, a small scale insect which feeds on certain species of cactus. From its body is obtained the bright red dye of the same name.

COCKROACH, an insect which is found in houses, ships and other places inhabited by man. Popularly known by the misleading name of "Blackbeetle." It is actually brown in colour, and is not a beetle.

COCKTAIL, a drink taken before a meal as an appetizer, containing spirit, liqueur, sugar, etc., and sometimes iced.

COCOANUT, or COCONUT, the fruit of a tropical tree which usually grows by the sea in sandy soil. A mature tree bears 50-100 nuts a year. Its long leaves are used for roofing and weaving into baskets. The nut is enclosed in a thick husk of fibre, called coir, from which ropes and mats are made. The kernel of the nut, known in bulk as copra, yields oil and fat used in the manufacture of soap, candles and margarine.

COD, a large and important food-fish inhabiting the colder waters of the Atlantic and Pacific, the Arctic Ocean and the North Sea. Enormous numbers are taken every year by hook and line and nets. The liver of the cod yields a highly nutritious oil, rich in certain vitamins.

COFFEE, the seeds of a shrub which seems to have originated in Abyssinia, whence it spread to Arabia and other countries. It is now grown extensively in the E. Indies, India and Kenya, but Brazil is easily the first of coffee-producing countries. When the fruit is ripe the seeds or "beans" are separated from the husk, fermented, dried and deprived of their parchment-like outer skin. They are then ready for roasting and grinding.

COLOSSEUM, the great amphitheatre at Rome, begun by the Emperor Vespasian in A.D. 72 and completed by Domitian in A.D. 82. After additions made in the 3rd century it was able to accommodate 70,000 spectators. Its walls are nearly 160 feet high. Much of the structure was removed in the 15th century for use in other buildings.

COMETS are bodies of rarefied matter travelling round the sun. Some have been seen once only; others, such as Halley's, return at regular intervals. A comet consists of a bright head, or nucleus, from which streams a tail, usually in the direction away from the sun. The luminosity of a comet is due partly at least to the reflection of sunlight, and partly to phosphorescence or electrical phenomena. In old times comets were regarded with awe, as harbingers of disaster.

COMMON LAW is the large body of English law derived from custom and tradition, as opposed to statute law, originated by Acts of Parliament. It is older than statute law, dating back to Saxon times; and has been added to and modified continuously by the decisions of judges. It is thus at the same time flexible and adaptable, and respected as based broadly on the essentials of justice.

COMMONS were originally tracts of land attached to villages for the common use of the villagers, who might graze sheep and cattle on, or take turves, wood or hay from them. Under the Normans they came under the control of lords of the manor, subject to the rights of commoners. They may now be enclosed only in the public interest. Many commons near large towns have become open spaces for public use under the control of the local government authority.

COMMUNISM, the Leninist view of Marxism which advocates the abolition of private ownership and gives the State sole control over the production and distribution of wealth and labour.

COMPASS. The original type of mariner's compass used for steering ships was the magnetic, first used in Europe during the twelfth century. The very highly-developed form now in use consists of a box, mounted in gimbals so as to swing freely in all directions without rotating; a very light card, graduated round the edge in degrees and marked with the 32 points, and very delicately balanced on a pivot; and a number of small straight magnets attached to the compass card in north and south lines. The box is covered with glass, and in some cases filled with liquid to steady the card. The magnetic compass has certain failings, some due to terrestrial magnetism, and for this reason has recently been replaced on many ships by the gyroscopic compass, which is not affected by such magnetism or by the proximity of steel and iron. (*See* GYROSCOPE.)

CONCORDAT, an agreement made between the Pope and the ruler or government of a country, to determine the duties

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

 Digitized by Arya Samaj Foundation Chennai and eGangotri

owed by the clergy to Church and State respectively. The most important concordats are those of 1516, between Francis I of France and Pope Leo X, and of 1801, between Napoleon I and Pope Pius VII.

CONCRETE, a mixture of Portland cement, sand, broken stone or gravel and water, which sets very hard, and is imperishable. Concrete is now used in large quantities in many forms of construction and engineering, since it can be easily moulded while wet and added to itself indefinitely without joints. Concrete, combined with steel rods buried in it in positions where they will take the stretching strains and bind the whole together, is called reinforced concrete. It is employed for bridges, large buildings and road foundations, and has been tried successfully in the construction of barges and even ships.

CONDOR, the largest species of vulture, which lives in the Andes. It subsists mainly on carrion.

CONGREGATIONALISTS, members of a nonconformist Church which dates back to the sixteenth century. In the time of Cromwell they were known as Independents, and are still sometimes called by that name. Congregationalists regard each congregation as a practically independent body capable of managing its own affairs, though the many congregations are linked in unions and associations.

CONGRESS, the Parliament of the United States of America, has an Upper House, the Senate, and a Lower House, the House of Representatives. Members of the Senate are elected by the legislatures of the various states; those of the Lower House by the people directly.

CONSCRIPTION, or compulsory military service, is the system under which every man is liable to serve in the Army or Navy for a period on reaching a certain age. It was adopted long ago by most European countries, and was applied in Britain in 1916 and reinstituted in 1939.

CONSERVATIVE, a member of the political party which is opposed to sudden and great changes in the laws and constitution of the country. The word came into use after the Reform Act of 1832.

CONSULS, in the time of the Roman Republic, were the two chief magistrates who, during their year of office, were the heads of the State. In Roman chronology the years were named after the consuls in each year. Though the office lasted till about A.D. 541, it became a mere sinecure under the emperors, who in many cases elected themselves consul. Today the word signifies an official appointed in a foreign country to assist citizens and the trade of the country which he represents.

CONTRABAND GOODS are articles and commodities which may not be imported at all, or which are admitted only after the payment of duty. Contraband of war signifies goods which may not be supplied by neutrals during hostilities.

CONVOCATION, the ecclesiastical parliament of an archbishop's province. Each of the Convocations of Canterbury and York consists of an Upper House of Bishops, under the presidency of the Archbishop; and a Lower House of other clergy. The two convocations, jointly with a House of Laity, compose the Church Assembly established in 1920 to deliberate on matters concerning the Church of England.

CO-OPERATIVE SOCIETIES are trading societies, registered under the Industrial and Provident Societies Acts, which distribute their profits among their members. A member may not have more than £200 invested in such a society.

COPPER, a red metal, one of the elements, which, next to iron, is the most useful of metals. It is sometimes found in practically pure masses, but most of the world's annual production of about 2,000,000 tons is smelted from copper-bearing ores. The chief copper-producing countries in recent years have been the U.S.A., Spain, Canada, Chile, Northern Rhodesia and the Belgian Congo. In the last, immense deposits are being worked, and these extend into Northern Rhodesia, which now exports great quantities of the metal.

Owing to its high conductivity, good mechanical properties and relative cheapness, most electrical conductors are made of copper. Alloyed with zinc and tin, copper makes brass and bronze respectively. It is used pure for cooking utensils, boiler tubes and fire-boxes, and useful decorative articles of many kinds.

COPTS are Egyptians whose ancestors stuck to Christianity early in the Christian era, instead of adopting, under compulsion, the faith of Islam.

COPYRIGHT is the exclusive right of multiplying copies of any original literary, dramatic, musical, or artistic work, belonging to the author of the same or a person or firm to whom he has conveyed it. Copyright of literary work is valid till 50 years after the death of the author.

CORAL is a hard limy substance formed by marine creatures called madrepores and polyps, which live together in great colonies. Red coral, the most valued variety, comes from the Mediterranean. In warm waters coral forms islands and reefs. A ring-shaped reef, enclosing a lagoon, is called an atoll.

CORDITE, a smokeless explosive for firearms and cannon. It consists of nitro-glycerine, gun-cotton, acetone and petro-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

leum jelly, pulped together and squeezed through dies to form threads, which are cut into lengths for packing into cartridges or other containers.

CORN LAWS, statutes for controlling the import of corn, especially wheat, into Britain, with the object of protecting British agriculture. The earliest dates from the fifteenth century, the last became law in 1842. Owing to widespread agitation against them the Corn Laws were repealed in 1846, and imported grain ceased to be taxed, except for a registration only of 1s. per quarter, which ceased in 1869.

CORONER, an official appointed by the crown to inquire into the death of any person who appears to have died by violence or unnatural causes. To the inquiry, called an inquest, he summons a jury of from 12 to 23 persons. Having heard evidence, he instructs the jury, who retire and give their verdict. If this is one of murder or manslaughter by a known person he issues a warrant for that person's arrest. Coroners also hold inquests into treasure trove; and, in the City of London, into the cause of fires.

COTTON, the fibrous down enclosing the seeds of a genus of shrubs grown in warm and tropical countries. There are many species, yielding cottons varying in length and fineness of fibre. The best cottons come from the United States—the chief cotton-growing country—and Egypt.

When the bolls or seed-capsules of the plant are ripe, they burst and the cotton protrudes. It is gathered along with the seeds, and passed through a machine called a gin, which separates the cotton from the seeds, husk, etc. The seeds when pressed yield a valuable oil and, after pressing, are used for cattle food. The ginned cotton is done up into bales for export. At a spinning mill it is thoroughly cleaned and teased out into the form of "cotton-wool," which is passed through machines that straighten the fibres and gather it into thick ribbons, called "slivers." Several of these are drawn out together repeatedly into coarse, loose threads, called "rovings." The rovings are spun by a ring frame or a "mule" into cotton thread fit for weaving.

COUNTY, originally a district under the rule of a count; now a geographical or administrative division of the British Isles. In England there are 40 geographical counties; but, as some of the larger are subdivided for administrative purposes, the administrative counties number 49. Even where there is no subdivision the political county does not always coincide with the geographical as regards boundaries. There are 52 geographical counties in England and Wales; 33 in Scotland; 32 in Ireland.

COUNTY COUNCILS were established under the Local Government Act of 1888 to govern the affairs of administrative counties. A county council has powers over all the territory of the county except any county boroughs in it. A council is elected by public vote for 3 years. It has powers to levy rates and borrow money, and is responsible for maintaining main roads and bridges, providing and maintaining asylums, reformatories and industrial schools, and administering laws connected with the pollution of rivers, infectious diseases, bird-protection and many other matters. Jointly with the county justices, it controls the county police force; and it has important duties regarding primary and secondary education in the county.

CREMATION, the disposal of dead bodies by burning, is a very old custom which was practised by the ancient Greeks and Romans, and is still followed in India and other countries. It was introduced into England in 1885.

CREOSOTE, a dark liquid obtained by distillation from wood tar or coal tar. It has a strong but not unpleasant smell, and antiseptic qualities which make it useful for preserving timber from decay. Wooden railway sleepers are saturated with creosote under high pressure.

CROCODILE, a large carnivorous reptile closely related to the alligator. Various species are found in Africa, India, the E. Indies, Australia, Central America and the northern part of S. America. Very large specimens have a length of up to 20 feet.

CROFTER, a small farmer or smallholder in the Hebrides, certain parts of the Scottish Highlands, and the Orkney and Shetland Islands. Several Acts of Parliament have improved the position of the crofters, who at one time suffered from high rents and insecurity of tenure.

CROMLECH, a prehistoric monument consisting of a large horizontal stone supported on upright stones, so as to form a rude chamber. Its purpose is uncertain.

CRUSADES were religious wars waged by the Christians of Europe against the Moslems, with the object of regaining possession of Jerusalem and the Holy Land, which had been in the power of the Moslems since the seventh century. There were eight crusades in all: in 1096, 1146, 1189, 1202, 1217, 1228, 1248 and 1270. The majority ended disastrously. Richard I of England took part in the third crusade, Edward I in the eighth. There were two so-called Children's Crusades in 1212, in the course of which some 50,000 children perished or were enslaved.

CRYSTAL PALACE, Sydenham, consisted of the buildings of the Great Exhibition of 1851, removed to the present site

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

from Hyde Park in 1851-54 and added to. It was opened in 1854. It covered 28 acres and was surrounded by 200 acres of grounds. It was destroyed by fire in 1936.

CUCKOO, a migratory bird, rather smaller than a wood-pigeon, whose name imitates its very distinctive cry. It spends April to July in this country. The female bird has the unique habit of laying her eggs singly in the nests of other birds, much smaller than herself, and leaving their incubation and the rearing of the young birds to the owners of the nests.

CUPID, the Roman God of Love, corresponding to the Greek Eros, son of Mercury and Venus. Represented as a young boy with a bow, used to shoot arrows into the hearts of lovers.

CURFEW, a bell rung at sunset (or eight o'clock in winter), as a signal to put out all fires and lights (French: *couvre feu*) and go to bed. It was introduced by William the Conqueror, probably as a precaution against fire in the wooden houses of the time. The custom is still perpetuated, purely as a custom, in a few places, and also in times of disorder.

CYCLONE, a circular storm of great violence which occurs usually in tropical latitudes. The W. Indies are specially subject to devastation by cyclones.

CYCLOPS, a race of giants in Greek mythology, having a single eye in the forehead. Homer, in his *Odyssey*, locates them in Sicily; later writers, in the Lipari Islands. They were compelled by Zeus to use volcanoes as forges, to fashion his thunderbolts.

CYNICS, a school of ancient Greek philosophers who affected to despise riches, the arts and other things that are valued by ordinary people. The best known of them was Diogenes, who lived the simple life in a tub.

CZAR, or TSAR, the title of the Russian Emperors, a corruption of the Roman word Cæsar. The last of the Czars, Nicholas II, was murdered with his wife and family at Ekaterinburg in July, 1918.

CZECHS, a branch of the Slav race, inhabiting Bohemia. Until after the First World War they were subjects of the Austrian Empire. They then united with their neighbours, the Slovaks and Moravians, to form the independent Republic of Czechoslovakia, with an area of 54,246 square miles, and a population of about 15,000,000. They are a highly civilized and intelligent people. Russia annexed Subcarpathian Ruthenia from Czechoslovakia in July, 1945.

DAB, a small flat-fish, common round the coasts of Britain.

DACE, a silvery freshwater fish, which rarely exceeds 1 pound in weight. It will take a fly and gives good sport, and is fairly good eating. It is found in the rivers of England and Wales.

DACOITS, armed robbers in India and Burma, who band together to terrorize, plunder, and even murder villagers. Except in very remote districts they have been suppressed.

DAIL EIREANN, the Lower House, or Chamber of Deputies, of the Legislature of Eire. Its members are elected on the principle of proportional representation.

DALAI LAMA (Ocean of Wisdom) is the title of the high priest or pope of the Mongolian Buddhists. His residence is at Lhasa, Thibet.

DAMASK, a rich silk fabric woven originally in Damascus. The word now extends to textile fabrics containing wool or cotton as well as silk, and used chiefly for upholstery and hangings; and to the class of linens of which napkins and table cloths are made.

DANCING, rhythmical movement, usually in time with music, has throughout the ages been a medium for expressing emotion, and giving vent to animal spirits in a disciplined manner. Many dances have a religious origin. Dances of this character are common among savages, and persisted in the Christian Church till the eighteenth century. The word "carol" signified a circular dance. Some dances are designed to produce a war-like frenzy, such as those of the Zulus and Indians, and many have an erotic origin. In modern times the stately dances, such as the minuet and "square" dances, have given place to dances for couples, the waltz, fox-trot, one-step, etc., accompanied nowadays by syncopated music. The popularity of dancing has increased enormously since the First World War, and with it that of the theatrical ballet.

DARWINISM, the doctrine put forward by Charles Darwin (1809-1882) in 1859 in his famous book, *The Origin of Species*, which attributes the differences between species of the same genus of animals, birds, or other living creatures to the struggle for existence that results in the survival of the individuals best able to bear it. Changes in environment cause the evolution of a species, suited to the new conditions, in the course of generations. His theory of evolution by natural selection provoked a storm that lasted for many years.

DATE PALM, a palm native to North Africa and Western Asia, the female trees of which bear large clusters of the fruit called dates. A fully grown tree may attain a height of 100 feet. Dates are a very important article of food among the Arabs.

DAY is a period of time divided into 24 hours. A solar day is the period

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

between two successive crossings of a given meridian by the sun. It varies slightly in length at different seasons, and for practical purposes the "mean (or average) solar day" is used. The civil day begins at midnight, the nautical and astronomical day at noon. In some countries the hours of a day are numbered consecutively from 1-24, instead of being divided by noon into two groups of 12 hours each.

DEAL, the timber of the Northern Pine (yellow or red deal) and the Norway Spruce (white deal). In the timber trade "deal" signifies various sizes of sawn softwood, ranging in section from 11×4 in. to 4½×2 in.

DEATH DUTIES are taxes payable out of the estate left by a deceased person.

DEATH-WATCH, a beetle which makes a ticking noise by striking its head against wood. The larvæ of this beetle bore into and do much damage to furniture and other woodwork. In olden times its ticking was regarded as a herald of death.

DEATH'S HEAD MOTH, a hawk moth, the largest of British moths. It has brown fore wings, and yellow back wings with wide black stripes. On the upper side of the thorax is a mark much like a skull, which gives it its name. It utters a sound like the squeak of a mouse.

DECALOGUE, the Ten Commandments given by God to Moses on Mt. Sinai, and regarded by Jew and Christian alike as the basis of religion and worship.

DECAMERON, a famous series of stories written by Boccaccio (1313-1375), an Italian. They purport to be tales told during ten days (the meaning of the title) by people wishing to divert their minds from thoughts of a plague then raging in Florence. It may have given Chaucer (c. 1340-1400) the idea of his *Canterbury Tales*.

DECEMBER, the twelfth and last month of the year. Its name was given it when it constituted the tenth month of the old Roman year, beginning with March.

DECIDUOUS TREES are those trees which shed their leaves in autumn and remain bare till the spring.

DECIMAL SYSTEM is one which uses multiples of 10. The metric system is a decimal system, 10 millimetres making a centimetre, 10 centimetres a decimetre and 10 decimetres a metre. It renders multiplication and division very simple when dealing with weights and measures.

DECLARATION OF INDEPENDENCE, a document adopted on July 4, 1776, by the American Congress, declaring the complete independence of the American colonies of Great Britain. It began the history of the United States of America. The draft was drawn up by a committee consisting of Thomas Jefferson, John Adams, Benjamin Franklin, Robert R. Livingstone and Roger Sherman, though Jefferson was virtually its author. The parchment was signed on August 2, 1776, by John Hancock as president of the Congress, and delegates representing the thirteen colonies. Among its declarations were that all men are created equal and endowed with certain inalienable rights, including life, liberty and the pursuit of happiness. The anniversary, Independence Day, is observed as a national holiday throughout the United Sttaes.

DECOMPOSITION is the breaking down of a substance into its constituent parts or other substances. Wood decomposes when it rots; china clay is decomposed granite. The decomposition or decay of animal and vegetable matter is hastened by various kinds of organisms called bacteria.

DECREE NISI, a decree of divorce which is provisional only, but will be made absolute at the end of 6 weeks *unless* (Latin, *nisi*) in the meanwhile new facts come to light to revoke the decree.

DEFENDER OF THE FAITH, a title conferred by Pope Leo X on Henry VIII for writing a defence of the Roman Church against Luther. It has been used ever since by the sovereigns of England. The original Latin title, "Fidei Defensor," appears on our coins abbreviated to "Fid. Def." or "F.D."

DELPHI, an ancient Greek town on the south slope of Mount Parnassus, was famous for its temple to Apollo, and for the oracle where the god replied, through the medium of a priestess, to people who came to consult him.

DELTA, a more or less triangular tract of land formed by deposits, where a river enters the sea: named after the Greek letter Δ (our D). Well-known examples are the deltas of the Nile, Ganges, Volga and Mississippi.

DELUGE, the terrific flood which is described in Genesis as overwhelming the world. A disaster of this kind is recorded by the legends of many nations. The story is probably based on a great inundation of Mesopotamia by the Tigris and Euphrates, of which written records go back for over 2,000 years.

DEMETER, the Ceres of the Romans, was the Greek goddess of agriculture and the fruits of the earth, and sister of Zeus. Great festivals in her honour were held yearly at Athens and Eleusis. (*See* PERSEPHONE.)

DEMOCRACY is government through [illegible] elected by the people

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

governed. The ultimate control is in the hands of the voters who, if dissatisfied, can change their representatives. Republics are démocracies without hereditary rulers. The U.K. system of government is democratic, since the real power lies with the popularly elected House of Commons, and the sovereign does not oppose decisions made by the legislature.

DERBY, THE, the most popular of English horse-races, the winning of which is the blue ribbon of the Turf, is run over a course 1½ miles long on Epsom Downs, on the last Wednesday in May or the first Wednesday in June. It was instituted in 1780. During the First and Second World Wars it was run at Newmarket.

DERRICK is a word used in two different senses: (1) a crane with a long jib, the top end of which is connected to the summit of a mast held upright by two sloping stays on the farther side: (2) a metal framework erected over an oil well, with a larger pulley at the top over which runs the cable used for operating drilling tools, balers, etc.

DERVISH, a member of a Mohammedan religious order. Some dervishes live an austere life; and those of one class, the dancing dervishes, work themselves into a religious frenzy, during which they lacerate themselves and perform feats, such as thrusting swords through their bodies without apparent injury, which cause wonder among spectators.

DESERTS are large tracts rendered barren and uninhabitable by lack of rain. A considerable part of the land surface of the world is desert—most of Arabia, Syria and Turkestan; the great Gobi of China; the vast Sahara in Africa; and enormous stretches of western and central Australia. Great areas of desert have, however, been reclaimed by irrigation, and their fertility shows that the land lacked only water to be able to grow vegetation. Most of the large deserts are rendered difficult to traverse by great ridges formed by the winds, out of the particles of disintegrated rock which we call sand.

DETECTIVES are police officials or persons employed by a private agency for tracking criminals or gaining information secretly. Detectives form part of every police force. The leading detective organization in England is the C.I.D. (Criminal Investigation Department) of the Metropolitan Police, the members of which are selected for their special qualifications.

DEVIL-FISH is a name applied to the gigantic ray, with a body up to 15 feet across, found in tropical waters, and to the octopus.

DEW is water deposited on vegetation and other things by the condensation of water vapour in the air or rising from the ground. It is heaviest on clear nights, when the air chills quickly and has to release some of its moisture. Grass attracts dew because it becomes colder than the earth from which moisture is still rising.

DIALECT, a form of a language peculiar to a certain district of a country. It may include a number of words not used elsewhere, but is largely a matter of pronunciation. Devonshire, Yorkshire, Lancashire, Norfolk and the Lowlands of Scotland all have their distinctive dialects.

DIAMONDS are transparent crystals of pure carbon, produced, it is believed, by great heat and pressure combined. With the possible exception of an alloy of tantalum, diamond is the hardest substance known. This quality makes diamonds valuable for boring rock, cutting stone, truing grindstones, and doing other work for which intense hardness is needed. But their wonderful lustre when cut and polished is the feature that makes diamonds so much sought after as jewels.

Africa is the world's great centre of diamonds. The chief diamond town is Kimberley, where diamonds have been mined since 1870. In the Premier Mine there the largest of all known diamonds, the Cullinan, weighing over 3,000 carats (about 1¾ lb.), was discovered in 1905. It was presented to King Edward VII, and cut into several pieces, the largest of which are among the Crown Jewels. In recent years extensive new diamond fields have been discovered in south-west Africa.

DICTAPHONE, a recording and reproducing phonograph, used in business offices as a substitute for personal dictation to a stenographer. A letter or other document is dictated into the mouthpiece of a machine which records the words on a wax cylinder. This is transferred to a reproducing machine in the typists' office. The cylinder can be shaved down repeatedly for further records.

DIDO, the legendary queen and foundress of Carthage, with whom Æneas fell in love during his travels after the fall of Troy. Deserted by him, she committed suicide. The story is in Virgil's *Æneid*.

DILEMMA, an argument from which there are two possible ways out, both equally discomforting to the arguer. Awkward positions of other kinds are also called dilemmas. For example, a man starts out to catch a train, and is overtaken by rain. If he goes on, he may be wet through; if he returns for his umbrella or mackintosh, he may miss his train.

DINOSAURUS, an order of huge lizards which lived on the earth long before man

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

appeared. The largest species, to judge by their fossil remains, attained a length of 80 feet.

DIPHTHONG, the combination of two vowels into a single sound, as oi in "boil," and ai in "aisle."

DIPTERA, the order of two-winged insects which includes the house-fly, blue-bottle fly and mosquitoes. Most of them have mouths or trunks with which they are able to suck blood or other liquids.

DISARMAMENT, the reduction of armies, navies and air forces, with the chief object of rendering wars less probable, and the secondary object of releasing larger sums of money for more useful purposes. Following the First World War several important treaties were signed between the Great Powers in regard to mutual disarmament. The Disarmament Conference of 1932-33 was adjourned when Germany left it.

DISESTABLISHMENT, in the ecclesiastical sense, means the complete separation of a Church from the State, so that it no longer has in any way a privileged position. The Anglican Church of Ireland was disestablished in 1869. An Act passed in 1914 disestablished the Anglican Church in Wales, but this did not come into force until 1920.

DISTEMPER (1) a mixture of whitening, size and water for covering walls and ceilings. If mixed with colouring matter is is called colour-wash. (2) An infectious and dangerous catarrh which attacks dogs, usually before they are a year old.

DISTILLATION is the process of separating liquids or solids into their constituents by heating followed by cooling. When sea water is boiled in a still the water passes off as steam and is reconverted into pure water in a condenser, while the salt and other impurities are left behind. Petroleum is broken up by distillation into petrol, naphtha, kerosene and heavy oils, which have different boiling-points and so can be distilled in succession.

DISTINGUISHED SERVICE ORDER (D.S.O.), an order conferred on commissioned officers in the Navy, Army and Royal Air Force, for special services in action. The ribbon of the order is red, with blue edges.

DIVING BELL, a large chamber formed of steel plates, open at the bottom, inside which men can work under water without the use of a diving dress. Air pumped in at a pressure exceeding that of the water outside keeps the interior of the bell free of water. A large bell has the dimensions of a fair-sized room, and may weigh 30-35 tons.

DOCKS are artificially enclosed sheets of water in which ships [illegible] unloaded, or remain while awaiting a cargo or undergoing repair. A "wet" dock is formed by surrounding its site with a trench, in which a massive wall is built, and then removing the earth inside the wall to the required depth. To prevent the water in a dock falling with the tide, the entrance to a dock is provided with gates or, in some cases, a lock. The quays round a dock are equipped with railway tracks, powerful cranes, warehouses and other things needed for the handling and storage of cargoes. The largest group of docks in Britain is that of the Port of London, which has enclosed water spaces totalling over a square mile in area.

Attached to most groups of wet docks is a "dry" dock or "graving" dock, which, when a ship has entered it, can be emptied, leaving the ship's hull completely exposed for repairs or cleaning and painting. In some ports a graving dock is replaced by a floating dock, consisting of huge metal pontoons which are sunk to allow a ship to come over them, and then pumped out until their buoyancy lifts the ship clear of the water.

DOCTOR, a Latin word signifying a teacher, is normally a title bestowed on persons who have passed examinations which qualify them to receive it. Universities and other institutions confer doctorates for medicine, theology, literature, law, philosophy, music and so on. The word is most commonly used of a medical man, who may be a Doctor of Medicine (M.D.). In some cases (outside medicine) the title is conferred by universities on eminent people whom they desire to honour.

DOG-DAYS, the hottest period of the year, from about the beginning of July to the middle of August. The ancients associated them with the influence of the Dog Star (Sirius), which was supposed to cause madness among dogs.

DOGE, the chief magistrate in the city republics of Venice and Genoa. In Venice the title was first used in 697: in Genoa, in 1339. It ceased to be used in both cities in 1797.

DOG-FISH, a family of small sharks, two species of which inhabit British waters. They are hated by fishermen for robbing their lines and injuring nets. Their rough skin is used for polishing wood.

DOG LICENCES, an annual licence, costing 7s. 6d. and expiring on December 31, must be taken out on every dog over 6 months old. Sheep dogs, cattle dogs and blind men's dogs are exempted.

DOLDRUMS, an almost windless belt of the oceans near the equator, in which [illegible] ships may be becalmed for weeks

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

on end. The calms may be interrupted by dangerous squalls.

DOLLAR, the unit of monetary value in the United States, Canada, Malayan Union, British Honduras, Liberia and the Dominican Republic. Under the name of peso it is also the unit in Cuba, Mexico and Panama. The term is an adaptation of the German thaler, first struck in Bohemia about 1518.

DOLOMITE, a rock consisting of the combined carbonates of calcium and magnesium. The name of The Dolomites is given to mountains in the Trentino, north Italy, composed of this rock.

DOLPHIN, a small species of the whale order, about 7 feet in length, and distinguished by a long, narrow beak. Often seen round the British coasts.

DOMESDAY BOOK, or Doomsday Book, a record made, by order of William the Conqueror, of all the lands of England, with details of ownership, area, cultivation, population and livestock.

"DORA," the initial letters and popular name of the Defence of (the) Realm Act, passed in 1914 to regulate the sale of certain commodities and other matters relating to national security.

DORMOUSE, a small rodent, with a bushy tail and reddish-brown fur, which lives chiefly on nuts and spends the winter asleep in a nest prepared for the purpose.

DORY, or JOHN DORY, a sea-fish much esteemed as food. It has a deep, flat body, and long spines on its back.

DOWSING, the art of finding underground streams or bodies of water or mineral, has been practised for centuries and regarded with a good deal of incredulity. The dowser, or diviner, walks over the ground holding a rod or pendulum in his hand, and judges by its movements when he is near what he seeks. Tests have proved beyond question that some people actually possess the power claimed by them; and water engineers now often call the dowser to their aid.

DRAGON, a fabulous winged creature with a long, scaly body, which breathed fire from its mouth. Dragons play an important part in many old legends in which they are overcome by knights, and figure largely in the religious sculpture and paintings of S. Asia and China.

DRAGON-FLY, a family of four-winged insects with long, narrow bodies and transparent wings. Many species are beautifully coloured. Dragon-flies feed on small insects and grubs.

DREDGING is excavating sand, earth, or rock below water and moving it elsewhere. Without constant dredging the Clyde, Mersey, Thames, many other rivers, and ship canals would cease to be navigable by large ships. Some dredgers raise the material with an endless chain of large buckets passing round a frame, one end of which is lowered as dredging proceeds. Others pump it up from the bottom through large pipes; and others, again, scoop it up with a huge ladle or raise it with grabs. The "spoil" is usually loaded into barges and taken away to be dumped where it will not be obstructive; but some dredgers contain large hoppers and do transporting as well as dredging. Where a depositing site on land is close by, the spoil is dumped continuously through long shoots, or through pipes floating on the water. This method enables dredging and the reclamation of land to proceed simultaneously.

DRUSES, a people of mixed Arab race, inhabiting a mountainous district of Syria round Damascus. Their religion is a compound of Mohammedanism, Judaism and other creeds. Their fanaticism has often made them troublesome to their neighbours. In 1925 they rose against the French authorities, and were suppressed after severe fighting.

DRY-ROT, a fungus (*Merulius lacrymans*) which attacks timber in damp, unventilated positions. It penetrates the wood, causing rapid decay.

DUBLIN UNIVERSITY, also known as Trinity College, was founded by Queen Elizabeth in 1591. Its library is one of the six in the British Isles entitled to receive a copy of every book published in Britain.

DUCK-BILL, also called Duck-mole, Duck-billed Platypus, and *Ornithorhynchus*, is a very curious quadruped found only in Australia and Tasmania. It has a body like that of a mole, but much larger, covered with a thick, short fur, a long beak, and short limbs with webbed feet, which carry powerful claws. The male has spurs on his hind feet, connected with poison glands, and can inflict dangerous wounds. The animal lives mostly in the water, and in deep burrows in banks. Its most extraordinary feature is that, though a mammal, it lays eggs, and thus is intermediate between the true mammals and the birds.

DUCKING-STOOL, a chair fixed to the end of a long pivoted beam, in which quarrelsome men and women or minor offenders against the law were tied and ducked several times. It went out of use early in the nineteenth century.

DUCTILITY is the quality which enables a substance to be drawn out lengthwise. The ductility of metals makes it possible to draw them out into wires. Gold is the most ductile metal; a single ounce of it has been extended into a wire 1,300 miles long.

DUELLING, single combat between

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

two persons, originated probably in the medieval trial by combat. It is now forbidden, in most civilized countries, as a method of settling private quarrels, and has been unknown in Britain since 1845. The German students' duel is so organized as to prevent fatal injury, and may be regarded as fencing with sharp weapons.

DUKE, the highest order of nobility in Britain. Sons of a sovereign who have dukedoms are royal dukes. A duke is referred to formally as His Grace the Duke of ——. His coronet is a circle of gold surmounted by eight strawberry leaves.

DUKERIES, a district of Nottinghamshire, near Worksop, in which are many large mansions, including two country seats (Worksop Manor and Clumber Park) of the Duke of Newcastle, Welbeck Abbey (the Duke of Portland) and Thoresby Park (Earl Manners).

DUKHOBORS, a Russian religious sect, many members of which emigrated to Canada in 1898 and 1899, under the guidance of Quakers, with whose tenets their religion has much in common.

DUMA, the Russian national assembly instituted in 1905 by Nicholas II, and abolished during the revolution of 1917.

DUMBARTON OAKS CONFERENCE, so-called from the name of the house in Washington, U.S.A., where it met in 1944. Tentative proposals for the maintenance of peace were drawn up by the U.S.A., Great Britain, Russia and China preliminary to a meeting of the United Nations at San Francisco in 1945.

DURBAR, a state reception in India by the Viceroy, a high official, or a prince. A durbar of great magnificence was held at Delhi in 1911, to proclaim George V Emperor of India.

DURHAM UNIVERSITY, founded in 1832, includes eight colleges in Durham, and two, the College of Medicine and Armstrong College, at Newcastle.

DYES may be divided into two classes: (1) natural dyes—most of them derived from vegetable matter—such as indigo, logwood, madder turmeric and cochineal; (2) artificial or synthetic dyes derived from coal products, which now greatly outnumber, and have largely replaced, those of the first class. The original aniline dye was accidentally discovered by Sir William Henry Perkin (1838-1907) while attempting to make artificial quinine from coal-tar, and was called mauve. Great Britain, slow to appreciate the commercial possibilities that were evidently latent in the by-products of coal-tar, allowed them to be developed on a large scale by Germany.

DYNAMICS, the science that deals mathematically with the causes and nature of motion. It is divided into statics, the

bodies. It is subdivided into mechanics, thermodynamics, electrodynamics and hydrodynamics.

DYNAMITE, a powerful explosive used in blasting, prepared by absorbing nitroglycerine in a siliceous earth called kieselguhr. The word is sometimes applied also to blasting gelatine, a gelatinous mixture of nitro-glycerine and gun-cotton.

EAGLE, the name given to the largest birds of prey of the falcon family. There are two British species, the Golden Eagle and the White-tailed or Sea Eagle. The latter feeds largely on fish.

EARL, the oldest and third highest order of English nobility, ranking next below marquis and next above viscount. The continental equivalent is count. This explains why the title of countess is given to the wife of an earl.

EARTH, the fifth largest of the nine planets, has a diameter of 7,926 miles at the equator and a polar diameter of 7,899 miles. Its weight has been calculated at 6,000,000,000,000,000,000,000 tons, equal to 5.6 times that of a mass of water of the the size. It has three motions: that of rotation round its axis once a day; that of revolution round the sun in an orbit which it completes once a year; and that through space with the whole solar system. In the course of untold millions of years the exterior of the earth has hardened into a non-luminous crust of rocks. It is uncertain whether the interior is solid, liquid, or gaseous; but, as is evident from the eruption of volcanoes, it must be intensely hot. Unlike its single satellite, the moon, the earth has been able to retain its atmosphere by the force of gravity.

EARTHENWARE, the general name for all classes of pottery which are opaque, both glazed or unglazed; as opposed to semi-transparent porcelain.

EARTHQUAKE, a violent trembling of the earth's surface, caused by internal slips or settlements of the earth's crust. Historic earthquakes are those in Sicily in 1693; at Lisbon in 1755; in Calabria in 1783; at San Francisco in 1906; at Messina in 1908; in Japan in 1923; at Quetta, Baluchistan, in 1935; and in Turkey in 1939 and 1943. (*See* SEISMOMETER.)

EARTHWORMS, though a nuisance on lawns, by reason of the casts which they leave on the surface, are very valuable to the farmer, as their burrowings allow air and water to enter deeply, and during its passage through their bodies earth is reduced to a fine powder. Charles Darwin calculated that the worms in an acre of ground dealt with ten tons of earth in a year.

EAST INDIA COMPANY was incorporated in 1600 to trade with India and the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

 Digitized by Arya Samaj Foundation Chennai and eGangotri

East Indies; but after 1623 it confined itself to India. "John Company," as it was popularly called, fought the Dutch and French and laid the foundations of British rule in that country. It gradually changed over from trading to political administration, and ceased to exist in 1858, when India came under the direct control of the crown.

EBONY, a very hard, dark wood obtained from various tropical trees. The black heartwood is the most highly valued.

ECHIDNA, a mammal found in Australia, Tasmania and New Guinea, which, like the Duck-bill (*see* DUCK-BILL), lays eggs. There are two species, both having bodies covered with spines. The Echidna lives in burrows and feeds on insects.

ECHO, sound reflected from hillsides, cliffs or other obstacles. The distance away of the reflecting surface is half the distance that a sound travels between its creation and its echo. This fact is used in the marine echo sounding-machine, which makes it easy to take soundings continuously while a ship is in motion, by timing echoes from the sea-bottom.

ECLIPSE, the cutting off of the light of a heavenly body by another body passing between it and the observer, or between the body and the source of light. Except at full moon, the moon is eclipsed more or less completely by the intervention of the earth between it and the sun. The sun is eclipsed partially or totally when the moon intervenes between it and the earth.

EDDYSTONE LIGHTHOUSE, on the Eddystone Rocks, 9 miles from the coast of Cornwall, near Plymouth, was completed in 1882. It rises 140 feet above its massive base. The present lighthouse is the fourth built on the rocks; its predecessors being Winstanley's, washed away in 1703; Rudyard's, destroyed by fire in 1755; and Smeaton's, which, after standing for over 100 years, became undermined and had to be dismantled.

EDELWEISS, an Alpine plant with light-coloured, woolly leaves, and clusters of small flowers, common on the Swiss mountains.

EDINBURGH UNIVERSITY was founded in 1582. The present buildings were erected at various periods since the middle of the eighteenth century. It has a very famous School of Medicine and a fine library. Many students matriculate there annually.

EDUCATION. Until 1870 all primary (elementary) schools in Britain were supported by voluntary contributions. In that year they were supplemented by Government, supported or assisted schools, called board schools, since they were placed under the control of county or borough school boards. In 1876 attendance at a primary school, unless adequate education was provided otherwise, was made compulsory; and in 1891 it was made free (in England) of cost to the parents of the scholar.

The Education Act (1944) provided for free primary and secondary education for all, the school-leaving age being raised to 15 and ultimately to 16. The local administration of education was reorganized, religious instruction was instituted in all State schools, and the Churches were enabled to carry on their own schools. A Ministry of Education took the place of the former Board of Education.

There are many technical schools at which special instruction in the arts and crafts is given. England will have (with North Staffordshire) twelve universities, Scotland has four, Wales one, Northern Ireland one and Eire two.

EEL, a somewhat snake-like fish, with scales either absent altogether or buried in the skin. Its body is noted for its slipperiness. There are two British varieties, the freshwater eel, which attains a length of 3 feet; and the marine conger eel, a much larger creature. Freshwater eels migrate to ocean depths to spawn.

EGRET, a small white heron, which at one time was mercilessly slaughtered for its long neck plumes, called aigrettes, worn in women's head-gear.

EINSTEIN'S THEORY OF SPACE is that space is not infinite, but bends back on itself, like the surface of the earth, until it comes together again; so that theoretically a star or nebula seen brightly in one direction should be seen in the opposite direction also, though more faintly, though other considerations make this unlikely. The theory, called relativity, accounts for many observed phenomena, and in broad outline is now well established.

EISTEDDFOD (pronounced ei-steth-vod), a gathering in Wales, at which there are competitions in poetry, literature, music, and arts and crafts. At the Welsh National Eisteddfod, held annually (in North Wales and South Wales alternately), the chief event is the chairing of the Bard, the winner of the poetical competition. Eisteddfodau (plural) are a survival from Druidical times.

ELAND, the largest of the antelopes, inhabiting the interior of Africa. The male stands nearly 6 feet high at the shoulders. Both male and female have spirally-twisted, straight horns, inclined backwards.

ELASTICITY, the quality possessed by a body which enables it to regain its original shape after being squeezed.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stretched, bent, or otherwise distorted. Steel possesses elasticity in a high degree.

ELDORADO, or EL DORADO, "the golden (land)," the name given by the Spaniards of the sixteenth century to an imaginary region in S. America abounding in gold.

ELECTRICITY is the name given to a form of energy or condition of matter, the true nature of which is still being explored. An electric current is accepted as being a flow of minute particles known as electrons. A body which has a surplus of electrons is said to be negatively charged, while a deficiency of electrons produces a state of positive charge. A condenser, when charged, has one set of plates electron-hungry, and the other electron-surfeited. As long as this unbalanced condition prevails, electricity is said to be static. When the condenser is discharged, this state ceases, there being now a flow of electrons to-and-fro until the electrons are equally distributed throughout the two sets of plates. While movement and adjustment last, electricity is in its "dynamic" state. This state can be produced indefinitely in a circuit by what is called an electric generator, which in effect is a pump compelling electrons to shift from atom to atom of the material of the conductor, though the material itself does not move like water being pumped through a circuit of pipes. One may regard an electric current, therefore, as an atomic transfer of electrons in the direction of lower electronic pressure or charge. The positive pole of an accumulator is—contrary to the old conception—that through which electrons *enter* to replace electrons flowing out at the other, or negative, pole. Electricity in motion creates a state of strain in the ether in its neighbourhood, called a magnetic field (*see* MAGNETISM); and, vice versa, a conductor moving through a magnetic field has a current produced in it. Electrical energy can be transformed into mechanical energy or work by motors; or into heat or light energy by encountering resistance. It plays an increasingly important part in modern life, owing largely to the fact that it can easily be transmitted through great distances, and be applied under conditions which eliminate noise, dirt, fumes, heat and mechanical complications. In countries in which large volumes of water fall from considerable heights, it enables the kinetic energy of moving water to be substituted for the heat energy of coal. Converted by the motor into mechanical work, it is rapidly extending its applications to the driving of machinery of all kinds, and to traction. The importance of electric power to nations is illustrated by the many schemes on which most civilized countries are engaged for instituting great steam or water-power generating stations, from which it can be distributed at cheap rates, to assist commerce and domestic life. Following the First World War, steps were taken to provide Great Britain (*see* ELECTRICITY BOARD, CENTRAL) with cheap electric power, mostly steam-generated. After the Second World War the British industry was nationalized.

ELECTRICITY AUTHORITY, BRITISH, was established in 1948 under the Electricity Act of 1947. This Act nationalized the supply of electricity in Britain and vested in the Authority all existing installations, giving it also the duty of future development. The new Authority absorbed the function of the Central Electricity Board established under the Electricity (Supply) Act of 1926. The Board's chief functions had been to construct a network of transmission lines (called the "grid"), linking up the power stations of the country; to standardize the frequency of the current generated; and to supply electricity in bulk to companies or corporations for distribution.

ELECTRIC RAILWAYS are those railways on which trains are propelled by electric power, concentrated in locomotives or distributed among a number of motors on the cars, all under the control of the driver. The latter is called the multiple-unit system. The electric locomotive is employed for long-distance haulage, or on stretches where electrical has to be substituted for steam haulage over a limited distance.

The electrification of railways is extending rapidly in countries such as Switzerland, Scandinavia and certain parts of France, Germany and Austria, where water power is abundant, but coal scarce; and is becoming standard practice for underground railways, or for the movement of trains through long tunnels.

The personal comfort of passengers in the underground railways of London, originally worked by steam, has been greatly increased since these railways were electrified from 1905 onwards. The deep-level railways (*see* TUBE RAILWAYS) of London and other great centres were made possible only by electric traction. For suburban passenger railways, on which the density of traffic demands that trains be run at very short intervals, electric travel has the advantage of giving very quick acceleration, owing to the great power which can be concentrated in a train. Most underground, and some surface, electric railways have conductors between or alongside the running rails; but for surface railways the usual method of supplying current is to have overhead

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

conductors, as on tramways, from which current is picked up by flexible "bows" on the locomotive or cars. In the United States trains are run by electricity for hundreds of miles at a stretch; and the most powerful locomotives in that country —and in the world—are electrical.

ELECTRO-MAGNET, invented by William Sturgeon in 1825, consists, in its simplest form, of a soft iron core surrounded by a coil of wire. When electric current passes through the coil, the core becomes a magnet, the attractive power of which depends on the size of the core, the strength of the current, and the number of the turns of wire in the coil. Electro-magnets form part of all electrical generators, being energized either by the current produced or from an outside source. Enormously powerful magnets are used for lifting heavy masses of iron or steel, and others of special design for extracting metal splinters from the human body. Almost every form of electrical apparatus either contains or makes use of the electro-magnet.

ELECTRO-PLATING, the process of coating metal or carbon with metal deposited on it, by the action of an electric current, from a chemical solution of the metal.

ELEGY, a poem of a mournful or reflective character. Originally, among the Greeks, it signified a dirge recited or sung at a funeral. The outstanding English example is Gray's *Elegy in a Country Churchyard*, one of the finest poems in our language.

ELEMENTS, in the chemical sense, are the simplest forms or substances into which matter can be broken up. Each element has qualities which distinguish it from the other elements. With the exception of six rare gases, every element will combine with others to form chemical compounds—of which almost all matter in its natural condition consists. The modern theory of matter regards the elements as differing, not in their ultimate nature, but merely in the number and arrangement of their component parts, electrons and protons. (*See* ATOM.)

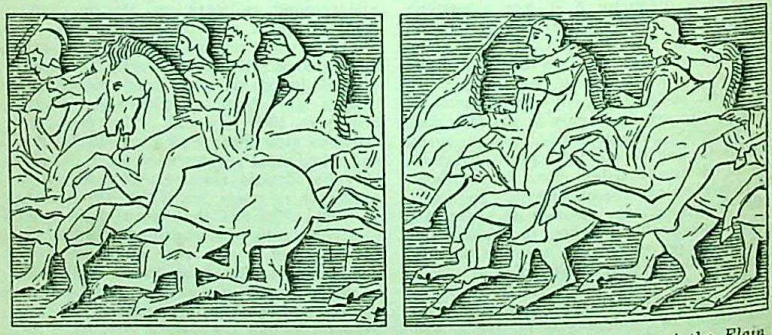
ELEPHANT, the largest of land mammals, distinguished by its large ears and long tusks and proboscis, or trunk, with which it transfers food and drink to its mouth.

The elephant is also remarkable for the jointing of its back legs, which have knees like the forelegs, so that they must be doubled under the body when the animal lies down. There are two species, the Asiatic, which can readily be domesticated, and the African, with larger ears, tusks and body. In recent times, at any rate, the African elephant has been used little while alive for human purposes, though it has been hunted mercilessly for its valuable ivory. The elephant's diet is entirely vegetarian. In prehistoric times the elephant was represented by the mastodon and mammoth.

ELGIN MARBLES, sculptures which formed part of the frieze and other portions of the Parthenon, Athens, brought to England by the seventh Earl of Elgin, and sold to the British Museum, in which they now are, in 1816.

ELK, or MOOSE, the largest of existing species of deer. The male stands over 6 feet high at the withers, and has huge antlers distinguished by a large, flat portion from which the tines project. It is a native of the northern forests of Canada.

ELM, the name of a genus of forest trees, the leaves of which are serrated at the edges and have the peculiarity of extending further down the stalk on one side than on the other. There are many British species, one of which is among the



Group of horsemen in low relief from the frieze of the Parthenon, part of the Elgin Marbles (now in the British Museum).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

commonest of our trees. It sometimes attains great age and enormous size.

ELYSIUM, the country to which, according to the ancient Greek and Roman poets, the souls of heroes and the righteous passed after death.

EMERY, an impure black aluminium oxide, almost as hard as diamond. Ground up into a fine powder, it is used for polishing metals, and wheels made of emery grains cemented together are used for grinding.

EMU, or EMEU, an Australian running bird, the largest of birds except the ostrich, to which it is related. The female is larger than the male and stands about 5 feet high.

ENCYCLICAL, a letter addressed by the Pope to the bishops of the Roman Church, giving instructions in regard to some important matter.

ENDOGENS are trees and plants, the stems of which increase in size by forming new bundles of fibre *inside* the old ones. When the outer layers have hardened, the stem cannot become any larger. All the palms are endogens. (*See* EXOGENS.)

ENERGY, in physics, is power of performing work. Besides mechanical energy, there are the energies of heat, light, sound, electricity and chemical action, which in most cases can be transformed one into the other. All forms of energy are either potential, or stored—a compressed spring and the chemical energy locked up in coal are examples—or kinetic, that is, due to motion or action, as in the case of a rotating fly-wheel or an electric current flowing through a circuit.

ENGLISH LANGUAGE contains about 400,000 words, as given in the greatest of English dictionaries, the *New English Dictionary*, completed in 1927. To a basis of Anglo-Saxon words the Norman Conquest added a large number of Norman-French words, of Latin origin, to which, during the Renaissance, were again added many words which were directly from Latin. This accounts for the English language being so rich in alternative words, such as "horse" and "cavalry," "work" and "labour," "friendly" and "amiable," and one of the most expressive of all tongues. As is only to be expected, English inherits some words from the old Celtic inhabitants of Britain such as "glen," "pool," "slogan" and "clog." The great expansion of the British Empire has imported Indian and other foreign words, examples of which are "tiffin," "mufti," "cash."

ENSILAGE, hay, clover and other fodder preserved in the green, undried state by heavy pressure or storage in air-tight chambers or pits.

EOCENE AGE, that period of the earth's history during which mammals developed into the most important of living creatures, and after that in which the great reptiles disappeared.

EPIC, a long poem describing heroic deeds and great achievements. Homer's *Iliad* and Virgil's *Æneid* are famous heroic epics of classical times. The *Song of Roland* is the great French epic; the *Poem of the Cid* the leading Spanish epic. Milton's *Paradise Lost* is the great epic of our language. Unlike those already named, it has a sacred theme.

EPIGLOTTIS, the flap attached to the back of the tongue which, when anything is swallowed, covers the entrance to the windpipe.

EPIPHYTES, plants which grow on the outside of other plants, and in many cases derive nourishment from them. Lichens, mosses and orchids are examples.

EQUATOR, an imaginary line round the earth midway between the poles. From it latitude is measured northwards and southwards. Its length is 24,902 miles.

EQUINOXES, the two moments of the year, one in the spring, and the other in the autumn, when the sun crosses the equator. Days and nights are of approximately equal length round the equinoxes.

ESCALATOR, a travelling staircase for conveying people up or down. By a very ingenious arrangement the treads at the entering end gradually resolve themselves from a flat platform into a staircase, and at the other end are slowly transformed back into a platform.

ESCURIAL, or ESCORIAL, the palace-monastery erected for Philip II of Spain in 1563-1584, on a mountain slope 24 miles south of Madrid. Built in fulfilment of a vow to St. Lawrence, it has the shape of a gridiron (on which the saint was martyred); and contains thousands of rooms, 4 miles of passages, and a fine church and library.

ESPERANTO, an artificially constructed language for universal use, published by its inventor, Dr. L. Zamenhof, of Warsaw, in 1887. It is built up from root-words common to European languages, and being strictly phonetic, and having a very simple grammar, is quickly learned.

ESQUIMAUX, or ESKIMOS, a race of probably Mongolian origin, inhabiting Greenland and the coldest parts of N. America. They are of short stature, are skilful hunters on land and sea, and handle their skin-covered canoes—kayaks and oomiaks—with great dexterity. Their chief foods are seal flesh and blubber, and fish.

ESSENTIAL OILS, strong-smelling, and in some cases fragrant, liquids obtained by distillation from the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stems, leaves, flowers, or seeds of plants. Examples: the oils of lavender, bitter almond, aniseed and wintergreen. Some are used as scents, some as flavourings, some in medicine and some in varnishes.

ESTATES OF THE REALM are three in number: the lords spiritual (archbishops and bishops); the lords temporal (the nobility); and the commons. The Press is sometimes called the Fourth Estate.

ETCHING, cutting designs in a copper plate with a sharp point, or eating them in with acid, so that prints may be made from the plate. The first process is called "dry-point," no acid being used. In the second, the plate is protected by a thin film of wax, which the etcher's tool cuts through, exposing the metal below to the acid, in which the plate is afterwards dipped. To take a print from an etched plate, the plate is inked over, wiped clean, and pressed against a sheet of paper, which picks up the ink left in the tiny grooves.

ETHER, the medium which is supposed to pervade all space and all matter, and to transmit light, radiant heat, wireless and other rays. Also a volatile carbon compound used as an anæsthetic and solvent.

ETHICS, the science of morals, investigates what a man ought to be and what he ought to do; and endeavours to give good reasons for its conclusions. It has been one of the great studies of philosophers of all ages, being closely related to religion and good citizenship.

ETON COLLEGE, Windsor, the most famous of the great public schools of England, and the largest boarding school, was founded in 1440 by Henry VI. The oldest buildings date from 1523. Of the 1,125 boys a minority are "King's Scholars," who have won scholarships; the rest are called "Oppidans."

ETYMOLOGY, the study of words, considered individually. It investigates their origin or derivation, and the changes which they have undergone; and is concerned with their inflections or modification, suffixes, endings, etc., and with the classes into which they fall.

EUCAINE, a drug which is injected into the body to produce local insensibility to pain by paralysing the nerves which it reaches, the patient remaining conscious.

EUCALYPTUS, a genus of evergreen trees and shrubs, native to Australasia. The best-known species is the blue gum (*see* BLUE GUM). Its leaves yield an aromatic oil which has valuable antiseptic properties.

EUGENICS signifies the science which aims at improving the human race by a careful study of heredity, and by promoting any practical means of developing those physical and mental qualities which are most desirable, while at the same time removing as far as possible causes of national deterioration. The founder of modern eugenics, Sir Francis Galton (1822-1911), bequeathed a large sum of money to endow a Chair at University College, London.

EURASIANS, people of mixed European and Asiatic blood, especially in India, Malaya and the East Indies.

EURYDICE, in Greek mythology, a nymph, wife of Orpheus. After her death, Pluto allowed Orpheus to restore her to life on condition that he should not look at her till they reached the upper world. In his anxiety to make sure that she was following him, he glanced back, and she was snatched away.

EVAPORATION, the changing of a solid or liquid into vapour which occurs when the vapour pressure of the substance is lower than the external pressure of the atmosphere or a gas. Its speed depends on temperature and outside pressure; and it takes place only from exposed surfaces. It is thus distinguished from ebullition, or boiling, in which the vapour pressure is increased by heat until vapour is given off from the interior of the substance as well.

EXCHEQUER, the national treasury; also used for the Government department which deals with the receipt and expenditure of public money raised by taxation to be devoted to national uses.

EXCOMMUNICATION, the exclusion of a person from taking part in the rites of a Christian Church, as a punishment for heresy, evil-living, or other offences. In the Middle Ages it was much feared, and even monarchs were subjected to it. (*See* INTERDICT, PAPAL.)

EXOGENS, trees and plants in which the size of stem and branches is increased by the annual addition of a new ring of tissue between the bark and the outside of the already existing wood. All our native trees, and most of our native shrubs and plants, are exogens. With few exceptions the seeds of exogens have two cotyledons, or seed-leaves. (*See* ENDOGENS.)

EXPLOSIVES are solid or liquid substances which, when heated or struck, ignite and instantaneously develop intense heat and change into gas that would naturally occupy a much larger space than the original substance. If confined, the gas attains a pressure which gives it disruptive power. Explosives are generally classified as "high" explosives, such as dynamite, blasting gelatine, and trinitrotoluol, fired by detonation; and "low," propelling explosives, such as gunpowder and cordite, act more slowly.

EXTERNAL DEBT, that part of a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

national debt which is due to other countries.

EXTRADITION, the handing over of a criminal by the authorities of a country in which he has taken refuge to the authorities of the country in which he has committed a crime, to be tried by them.

EXTREME UNCTION, a sacrament of the Roman Catholic Church, administered to a person believed to be on the point of death. The priest anoints the eyes, ears, mouth, nose, hands and feet, and prays for pardon of any sins committed through the use of these.

FABIAN SOCIETY, a society founded in 1883 to promote the aims of Socialism.

FACSIMILE, an exact copy or reproduction of a thing. Facsimiles of typewritten letters are made by using carbon tissues; facsimiles of handwriting, documents, etc., can be made by photography. Coins stamped from the same dies, and papers printed from the same type, are in a sense facsimiles of one another.

"FAERIE QUEENE," the most famous poem of Edmund Spenser, published in two parts in 1590 and 1596, and left incomplete. Under the guise of an allegory it deals with contemporary historical matters, Gloriana, round whose court the story centres, being Queen Elizabeth.

FAHRENHEIT.—*See* THERMOMETER.

FAIENCE, a general name for glazed earthenware. Originally the term was confined to ornamental ware manufactured at Faenza, in Italy.

FAIRS were originally religious festivals which brought large numbers of people together. Advantage was taken of this to do trading, and gradually they developed into markets, held frequently or, in some cases, at long intervals. In the Middle Ages they were of great importance. Improvements in rapidity of travel have caused their eclipse, though the great fur fair at Leipzig, in Germany, held its own until the Second World War. In recent years the British Industries Fair, held annually in London and Birmingham, has assumed great importance, attracting buyers from all parts of the world.

FAIRY RINGS in meadows are caused by a fungus, which spreads outwards from a centre, and, by fertilizing the ground, makes the grass longer and greener just inside the belt of growth.

FAKIRS, Mohammedan or Hindu ascetics, who subject themselves to great hardships—such as lying on beds of nails, and holding out their arms till they wither—and live largely on alms.

FALANGISTS, members of a Spanish political party whose first leader was Antonio Primo de Rivera. They took part in the civil war (1936-39), headed by General Francisco Franco, who was proclaimed Caudillo, or Chief of the State. They were aided by Italy and Germany, while Russia sent help to the Republican Government. Nominally neutral during the Second World War, the Falangists showed sympathy with the Axis. The Falangist policy was similar to that of Fascism, the name being derived from the Macedonian phalanx. (*See* PHALANX.)

FALCON, the name given to those birds of prey which are smaller than the eagles, and at one time were used as a means of capturing game. The species most valued for the purpose were the Icelandic, or *gyr*, falcon and the peregrine. The latter is found in some parts of the British Isles.

FALSETTO, the highest register of the male voice, which enables a singer to reach notes higher than those attainable with his natural voice.

FANTASIA, a musical orchestral piece, which does not come under the ordinary forms of composition, and is in many cases a medley of popular airs.

FAN-TRACERY, a very beautiful form of decoration of vaulted ceilings used in the Perpendicular period of architecture. It consists of ribs radiating from centres, such as the top of columns, and meeting at the apex in a circle. Fine examples may be seen at Westminster Abbey, Bath Abbey, and Christ Church, Oxford.

FASCISM, a movement set on foot in 1919 by Benito Mussolini, originally to combat the excesses of Italian revolutionaries. Members of the movement adopted as their symbol the bundle of staves containing an axe which in old Roman times was called the *fasces* and was carried by the lictors as the emblem of justice; and wore a black shirt as part of their uniform. Fascism spread so rapidly that in 1922 Mussolini was able to organize a great march on Rome, which resulted in his being made premier with practically dictatorial powers. Fascism became all-powerful in Italy, and similar movements were organized in other countries.

FASTEST ANIMALS.—Among quadrupeds, first place should probably be given to the cheetah, over short distances. Horses and greyhounds have to their credit timed speeds of over 35 m.p.h. Tests made in American deserts by chasing animals with a motor car assign speeds of 62, 47 and 45 m.p.h. to the antelope, mule deer and coyote respectively, for a few miles; but these need verification. Among birds, the golden eagle has been known to keep pace with an aeroplane travelling at 90 m.p.h., and even higher speeds have been registered in the case of some sea birds. Insects are credited with speeds of a high order, but here again exact and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

reliable observations remain to be made. The highest speed officially timed for human beings is between 21 and 22 m.p.h

FATALISM, the doctrine that everything which happens was determined beforehand; so that it is useless for a man to attempt to escape, by any efforts of his own, from what is fated for him.

FATHOM, a measure of six feet, used in taking marine soundings and for the lengths of ship's cables.

FATS are animal and vegetable substances compounded of carbon, hydrogen and oxygen. They constitute a reserve of food in the case of an animal, and in winter help to keep it warm. In whales the thick coating of blubber fat performs the function of fur in other mammals. Vegetable fats are contained mostly in seeds, to supply nourishment to the germ during early growth. As food, fats produce heat and energy, and are needed most in very cold climates. They are used in the preparation of other foods, and are very valuable commercially either in their natural state or for the oils extracted from them.

FEATHERS correspond in birds to the scales of fish and reptiles and to the hair of mammals. A feather consists of a central shaft or rib, which towards the base is hollow, and a multitude of barbules projecting from both sides of the shaft. Body feathers are short and soft, their purpose being to confine air and keep the body warm. The long wing and tail feathers, called quills, are stiff and strong, as they have to carry and steer the bird while in flight. The tail feathers of the males of many species—peacocks, lyre-birds, turkeys, for example—are greatly developed, probably as ornaments to attract the females.

FEATHERWEIGHT, in boxing, a weight ranging between 8 st. 6 lb. and 9 st.

FEBRUARY, the second month of the year, having only 28 days except in a leap year, when another day is added. The word means "The month of purification."

FELLAHS, or FELLAHIN, the peasant population of Egypt. Some are small farmers, renting land from landowners, but most are farm workers.

FELLOWSHIP, a distinction conferred on a graduate of a university, which in most cases places him on the foundation of a college and carries an income in return for certain services. Some fellowships are honorary only. Members of many learned societies are termed Fellows.

FELSPAR, silicates of alumina, combined with sodium, potassium, and other elements, occurring in many forms. They are generally grey or white and are important constituents of rocks. On exposure to weather they decompose and release soda and potash, which are valuable to plant life.

FELT, a fabric manufactured by matting short woollen fibres together mechanically into a dense sheet, and used for hats, carpets and other floor coverings.

FENIANS, members of an organization in Ireland formed in 1858 to bring about the complete independence of that country. Crimes committed by them led to stern measures being taken against them. Eventually they were merged into the Land League and National League.

FENS, a tract of low-lying land, over 1,000 square miles in area, in the East of England, extending south from the Wash through Lincolnshire, Norfolk, Huntingdonshire and Cambridgeshire. In old times the rivers which flowed through the fens, being unable to discharge into the sea at certain states of the tide, converted them into vast morasses. At various times since the beginning of the sixteenth century schemes for their drainage have been carried out, and many acres have been added to them by reclaiming land from the sea by means of sea wall. They are now in places very productive of cereal, potato and other crops. (*See* BEDFORD LEVEL.)

FERRET, a domesticated and small variety of polecat, used for driving rabbits and rats from their burrows or other hiding-places. Most ferrets are albinos.

FEUDAL SYSTEM, or FEUDALISM, a social system which spread over Europe after the breakdown of the Roman Empire. It was based on self-protection; weaker folk placing themselves under a stronger overlord from whom they held their land, and whom they supported in the field, in return for protection against outsiders. At the head was the supreme overlord, the monarch, and under him in turn the greater barons, the lesser barons, and the yeomen. Where the ruler was weak, a kingdom tended to split up into more or less independent districts, each dominated by a powerful baron. William the Conqueror, when introducing the Norman feudal system, took the precaution of making every freeman swear fealty to him directly as well as to his immediate overlord. During later reigns feudalism became a menace to orderly rule, and the danger disappeared only under the strengthening of the sovereign's power by the Plantagenets and Tudors, and the development of representative government.

FIELD OFFICER, an army officer holding a rank above that of captain and below that of brigadier; a colonel, lieutenant-colonel or major.

FIFTH COLUMN, a term applied by General Emilio Mola during the Spanish

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Civil War of 1936-39. When Franco's army was closing in on Madrid, Mola said he had four columns approaching the capital and a "fifth column" within the city, namely those who would help at the appropriate time. Those suspected of working for the Germans and Italians in allied countries during the Second World War were familiarly called by this term.

FIG, a tree or shrub belonging to the genus *Ficus*. The common fig, the pear-shaped fruit of which is eaten raw or dried, comes from Asia. It was introduced into England in the seventeenth century.

FILMS.—*See* CINEMATOGRAPH, TALKIES.

FILTER, an apparatus for straining impurities out of a liquid or gas. The water supply of a town is usually passed through filter-beds spread with gravel below and sand above. For household purposes the high-pressure filter is sometimes used. This has a strainer of unglazed porcelain, through which the water is forced. A filter of this kind will arrest disease bacilli. Other forms of filter are used for industrial purposes, including one in which the liquid is driven through filter papers. In wireless, a device called a wave-filter is used to sort out waves of different frequencies.

FIR, a genus of cone-bearing trees, having the botanical name *Abies*. They differ from the closely-related pines in the arrangement of their leaves. The so-called Scotch fir is a pine. The Norwegian spruce fir and the American Douglas fir yield valuable timbers.

FIRE-BRIGADE. — Until about 1820 the extinguishing of fires was left largely to the voluntary efforts of untrained persons operating, in some localities, hand engines of limited power—a system which still prevails in remote districts. The fire-brigade, consisting of a group of men specially trained in fire-fighting and rescuing people from burning buildings, and equipped with efficient engines and other apparatus, dates from 1833, when fire-insurance companies organized brigades to reduce their losses. The steam fire-engine, which appeared in 1858, was of enormous help to firemen, being able to deliver much greater quantities of water in a given time, and to project it farther, than any hand engine. It has since been superseded by the motor fire-engine, which is self-propelling and able to travel at much higher speeds than its horse-drawn predecessor, and uses its motors also for driving the pumps. An important feature of modern fire-fighting practice is the portable "water-tower," which enables water to be discharged from above on to the upper parts of a burning building. Fire-brigades, previously under the control of 1,168 separate authorities, were reorganized and became the National Fire Service in 1941.

FIRE-DAMP is the name given by coal-miners to carburetted hydrogen gas which escapes from coal seams, and if ignited may cause a serious explosion. It renders the use of "safety" lamps necessary in many coal mines.

FIRE-ENGINES.—*See* FIRE-BRIGADE.

FIRE-FLY, a genus of tropical flying beetles which emit light from parts of the body. The glow from some species is so strong that natives use caged beetles as a reading-lamp or lantern.

FIRES, GREAT.—The most notable conflagrations in cities were those in London, 1666 and 1941; Moscow, 1812; San Francisco, 1906; and Tokyo, 1923. The first was accidental; the second due to air raids by the Germans; the third intentional, to checkmate the invading French army under Napoleon; and the last two the result of earthquakes.

FISH, a large order of vertebrate or backboned animals, which live in water. They reproduce themselves by laying eggs, and are distinguished from the reptiles and mammals by breathing through gills, which extract from water air dissolved in it. A few species, coming under the class of dipnoi, have rudimentary lungs as well as gills, which enable them to exist during times of drought, when they have to breathe atmospheric air. The Indian climbing perch is able to mount perpendicular walls and even trees, and while travelling overland keeps its gills moistened with water stored in special receptacles.

Fish are cold-blooded animals, that is, their blood temperature varies with that of the water in which they live. Their bodies are so shaped that they move through water with a minimum of resistance and their general "lines" have been adopted for submarines, airships, torpedoes and the underwater portions of ships. Most are provided with a swimming-bladder, the expansion or contraction of which enables them to rise or sink quickly in the water.

Their organs are small relatively to the body, which is mainly a mass of muscle, needed to propel them through a dense element. They carry practically no fat, though some species are oily. Movement is given by the tail, which in fish is vertical, as opposed to the transverse tail of the mammal whale family.

FIVE-YEAR PLAN, a vast scheme set on foot in the Union of Socialist Soviet Republics (European and Asiatic Russia) in 1928, to be completed in five years. Its object was to equip Russia with factories, railways, roads, hydro-electric

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

stations. Russia's natural resources are being exploited to the utmost, with the object of rendering the U.S.S.R. self-sufficient in economy and armaments. The whole population is compelled to work, so that exports may suffice to purchase the machinery, etc., needed for realizing the Plan, which was followed by a second Five-Year Plan in 1933.

FIXED STARS is a term covering all the large heavenly bodies except the planets. The stars are said to be fixed because, owing to their vast distances from us, they do not perceptibly alter their positions relatively to each other.

FLAGELLANTS were religious fanatics of the thirteenth and fourteenth centuries, who went about in bands scourging one another as a method of doing penance. They spread from Italy over a large part of Europe, and after the Black Death became such a nuisance that they were suppressed by order of the Pope.

FLAG OFFICER, an executive officer in the navy, who has the right to fly a flag instead of a pennon on the ship in which he is. His rank is superior to that of captain, and the term covers admirals, vice-admirals, rear-admirals and commodores. Ships under his immediate command take orders from him.

FLAMINGO, a tropical wading bird, distinguished by its long legs and neck, curiously shaped beak, and pink or red plumage. It is a native of Africa, Central America and India. Its nest is a high mound with a hollow for eggs at the top.

FLANNEL, a fabric of open texture woven from soft woollen yarns. Some flannels have the nap raised on both sides.

FLAX, a plant with a beautiful blue flower, grown for the fibre derived from its stem, which is woven into linen; and for its seed, called linseed, from which a valuable oil is derived, while the husks are useful as cattle food.

FLEAS, a class of very small insects with mouths adapted for sucking blood, and having one pair of legs so powerful as to enable them to jump relatively great distances. There are many species, some peculiar to a particular kind of mammal or bird.

FLEMINGS, natives of Flanders, in Belgium, are of mixed French and Germanic descent. Their language, Flemish, is closely related to Dutch, whereas French is spoken by other Belgians. Immigrant Flemings brought the arts of weaving woollen cloth and silk to England in the Middle Ages.

FLINT is a mineral, consisting of almost pure silica, occurring in nodules or lumps in chalk. These are thought to have been formed by the deposition of silica from sea water round a nucleus of some kind. Being intensely hard, yet easily split, flint in prehistoric times provided mankind with weapons and tools. In modern days small pieces of flint have been, and still are in some places, used in firearms to strike a spark and ignite the charge.

FLITCH, DUNMOW, a flitch of bacon awarded, after trial by a mock judge and jury, at Dunmow, Essex, to a married couple who can prove that during the preceding year and a day they have neither quarrelled nor repented of having married. This ceremony was instituted in the thirteenth century, but lapsed for some centuries, to be revived in recent years.

FLOUNDER, a species of flat-fish, inferior as a food to soles and plaice.

FLUTE, a musical wind instrument, consisting of a wooden tube with a row of holes along one side. The performer blows into one of these, holding the instrument across the mouth, and makes the desired notes by closing or uncovering the other holes with his fingers or keys. Hard blowing raises the pitch an octave.

FLY is the general name of many species of insects in the winged stage. When used without any qualification it generally signifies the house-fly.

FLYWEIGHT, a boxer of the lightest class, weighing not more than 8 st.

FLYING DUTCHMAN, the legendary phantom ship of Van Straaten, a Dutchman condemned for a heinous crime to strive fruitlessly till Doomsday to round the Cape of Good Hope.

FLYING-FISH, a species of tropical fish (*Exocetus volans*) with its pectoral fins so much enlarged that it is able to propel itself with them for a considerable distance through the air to escape a foe.

FLYING-FOX, the name of several species of fruit-eating bats common in India, the East Indies and Australia. In the last-named country vast flocks of them may be seen leaving the forests for fruit orchards in the dusk.

FLYING-SQUIRREL, a squirrel with membranes between its fore and hind legs which enable it to make long glides through the air. Various species are found in Asia, Europe, Africa and North America.

FOG is condensed particles of aqueous vapour, otherwise cloud, at or near ground level. In and near great cities it is made much denser by soot and other impurities. What is called an overhead fog may produce almost complete darkness at midday, though the air near the ground is clear.

FOLIO, the size of page given by folding a sheet of printing paper once. The dimensions vary, of course, with those of the sheet. Crown folio is 15 × 10 in.

FORGERY is the making or altering of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

papers, documents, etc., with intent to defraud, and is punishable as a felony. Common forms of forgery are imitating a person's signature and the production of spurious paper money.

FORMIC ACID is an organic acid which renders the bite of an ant (after which it is named), or the sting of a bee or wasp, so painful.

FORTH BRIDGE, spanning the Firth of Forth at Queensferry, is the largest cantilever bridge in the U.K. (*see* BRIDGES). Completed in 1889, it has two main spans of 1,700 ft. and a total length of over 8,000 ft. Its railway tracks are 150 ft. above the water.

FORUM, the open-air market and general meeting-place of an ancient Roman city. The most interesting historically is the old Forum at Rome, about 200 yards long by 36-70 yards wide, surrounded by courts of justice, and the scene of national assemblies.

FOSSILS are remains of animals or plants found embedded in sedimentary rocks. In all cases the original tissues have been replaced by lime, silica or other mineral, forming a cast of the same shape as the original.

FOUNDING, or CASTING, is the art of constructing hollow moulds having the internal form of some object or part required, and filling them with molten metal. An article produced in this way is called a casting.

FRANC, the monetary unit in France, Belgium and Switzerland.

FRANKS, Germanic tribes which in the third century settled along the Rhine, and in the fifth century occupied a large part of France, to which they gave its present name. Under the Carlovingians, of whom Charlemagne was the greatest, they became very powerful. After his death they split up into the kingdoms of Germany, France and Burgundy.

FREE TRADE means that imports are not taxed in order to protect home industries, no distinction being made between home-produced and foreign-produced goods and commodities. It does not, however, imply that certain classes of imports may not have duties levied on them to raise revenue. During the period 1823-1860 England dropped protective duties and finally became a free trade country—though maintaining revenue duties on tea, tobacco, wine, silk, etc.—and threw her markets open to the world. In 1931 financial pressure compelled her to abandon Free Trade in favour of Protection, which was the policy of practically every other nation.

FRESCO, a painting done on a plastered wall with special pigments. The earliest frescoes were painted on freshly-laid and still damp plaster, added to day by day as the picture proceeded. "Dry" fresco is a more modern process, under which the plastering is completed and allowed to dry, and damped again to be painted on.

FRIARS, members of certain religious orders—Dominicans, Carmelites, Augustinians, Franciscans, etc., founded in the Middle Ages. These were termed "mendicant" or begging orders, because friars lived on alms collected from door to door or left at their headquarters.

FRIDAY, the sixth day of the week, is named after the Scandinavian goddess Freya or Frigga, wife of Odin. Its connection with the crucifixion of Christ led to its being regarded by Christians as unlucky.

FRIENDLY SOCIETIES are voluntary associations formed to give their members help in times of sickness, provide a sum of money at death, enable savings to be accumulated, or otherwise promote security for the future. Among the largest and best known are the Oddfellows, Foresters, Rechabites, Ancient Shepherds, Sons of Temperance, Hearts of Oak and National Deposit. Their membership runs into many millions, and their funds exceed £150,000,000. Most are registered under the Friendly Societies Act of 1896.

FRIENDS, SOCIETY OF, or QUAKERS, a sect founded in 1647 as a result of the preaching of George Fox. Its members regard personal inspiration as the only certain source of truth, and therefore do not recognize the final authority of the Scriptures, and reject a ministry, sacraments (as outward acts), ritual and a liturgy. Their history entitles the Quakers to the greatest respect for their industry, generosity and humanitarianism.

FROGS are amphibious animals which begin life in water as tadpoles, furnished with a tail which disappears in the adult stage. They are excellent swimmers, but most species live mainly on land. Foreign species include the edible frog, and the tree frog, which lives in trees.

FROST is the climatic condition prevailing when the temperature of the air is at or below freezing point. Exposed water turns into ice and the earth hardens owing to the water particles in it being frozen and binding the soil together. A very severe frost in England in modern times was that of 1895, which began on January 25, and lasted almost seven weeks.

FUGUE, a musical composition, in which a short air of a few bars is given out in one part and answered by other parts in turn, the subject and counter-subject being woven together. It is the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

 Digitized by Arya Samaj Foundation Chennai and eGangotri

most "scholarly" form of composition. Its greatest exponent was Johann Sebastian Bach (1685-1750).

FUNGI are plants distinguished by their rapid multiplication and growth, and by their inability to absorb carbonic acid gas from the atmosphere. Their species are numerous, including yeasts, many minute parasitic forms causing disease and decay in animals and plants, and large agarics, to which mushrooms and other edible fungi belong.

FUR, the coat of dense, soft and short hairs with which many mammals are covered, as a protection against cold. The most highly prized furs are the winter coats of animals inhabiting cold regions.

GABLE, the triangular part of a wall above the eaves at the end of a double-pitched roof.

GAELIC, the language of the Gaels, is spoken in the Highlands of Scotland, the Isle of Man and in some parts of Ireland; but the word is now sometimes restricted to the Scottish branch. Closely related to Welsh and Breton.

GALENA, sulphide of lead, a crystalline ore which is the chief source of the metal. Small fragments of it are used in wireless "crystal" detectors.

GALL, or BILE, a liquid secreted by the liver and stored in the gall-bladder. Its functions are to assist digestion and purify the blood.

GALLEY, a low, flat-decked ship, used by the ancients, and in the Mediterranean in medieval times till about 1600. It was propelled by oars—worked by chained slaves—and also carried sails.

GALVANIZING is the process of coating sheets or other steel or iron articles with a protective film of zinc by dipping them in a bath of molten zinc. It was originally an electro-plating process, hence its now somewhat misleading name.

GAME is a general term for wild birds and animals which are hunted both for sport and for their value as food. In Britain the word applies specially to those protected by the Game Laws, and in some cases, e.g. partridges, pheasants and grouse, not allowed to be killed at all during what is called the "close" season, when they are breeding and rearing young. Certain species of fish—salmon, trout, grayling and char—are called game fish.

GANGWAY, in the Parliamentary sense, is a narrow passage in the House of Commons, transverse to the rows of seats, which divides the rows into two groups on each side. The more important members of the party in power and of the Opposition sit "above the gangway," that is, in the group nearer the Speaker's chair on their respective sides of the House.

GANNET, or SOLAN GOOSE, a large sea-bird, related to the cormorant, with white plumage and a powerful pointed beak. It lives on fish, which it catches by diving from a height.

GARDEN CITIES are towns laid out on an ordered plan which provides plenty of room for gardens, public spaces and recreation grounds. The pioneer in England was that at Letchworth, in Hertfordshire, covering several square miles.

GARGANTUA, an immense giant of old French legend, who could drain a river at a draught. He is the leading figure in one of Rabelais's burlesques.

GARNET, a semi-precious stone, dark red or green in colour.

GARROTTE, execution by strangling, a form of capital punishment once used in Spain.

GARTER, ORDER OF THE, instituted by Edward III in 1348, is the highest order of British chivalry. Its motto is "Honi soit qui mal y pense" (May evil come to him who thinks evilly); and its insignia are a dark blue velvet garter, worn below the left knee; a star, worn on the left breast; a badge, on a broad blue ribbon worn slantwise across the body and passing over the left shoulder; and a collar, carrying another badge, called the George.

GAS-ENGINES are engines which consume their fuel—an inflammable gas, mixed with air—inside their cylinders, in periodic explosions, which move the pistons and the parts attached to them. The term is more commonly used of an engine using coal-gas, producer-gas, or blast-furnace gas; but technically it covers petrol, paraffin and other "internal combustion" oil-engines, for which a liquid fuel, vaporized by spraying or heat before it enters the cylinders, is used, as the working principle is exactly the same in all cases. The first practical gas-engine appeared in 1823. After being compressed in the cylinder, the mixed charge of gas and air is ignited—usually by an electric spark—and the heat developed causes it to expand with great force, and drive the piston outwards. In engines using what is called the four-stroke cycle an explosion occurs in each cylinder during every other revolution of the crank-shaft, as one revolution is needed to drive the burnt gases out of the cylinder and suck in a new charge. The more recently developed two-stroke cycle, however, provides for an explosion every revolution, a previously compressed charge sweeping out the exhaust gases and filling the cylinder simultaneously during the return stroke follow-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ing the explosion stroke. For a gas-engine to give a steady turning movement it must have a flywheel—or its equivalent, in the form of a propeller, etc.—or have the power distributed over a number of cylinders, developing power strokes at equally spaced moments of a revolution. The lighter the flywheel, the more numerous must the cylinders be.

GASES are fluids capable of indefinite expansion, and much lighter than liquids. Most of them are perfectly transparent. By chilling and pressure a gas may be transformed into a liquid state; and vice versa a liquid can be changed into a gas by heat.

GAUGE, a standard dimension, thickness, or diameter; or an implement or tool for measuring the same. Wires are drawn, and metal plates rolled, to gauges fixed by associations or societies. The gauge of a railway is the distance between the two rails of a track. In Great Britain, Canada, the United States, Mexico, Peru, Egypt, China, Norway, Sweden, Denmark and the Irish Republic the standard railway gauge is 4 ft. 8½ in.; in Austria, Belgium, France, Germany, Holland, Italy, Spain and Switzerland, 4 ft. 9 in.; in India, Argentina and Chile, 5 ft. 6 in.; in Spain and Portugal, 5 ft. 5⅝ in.; in New Zealand, Nigeria, S. Africa, Japan and the Sudan, 3 ft. 6 in.; and in the eastern countries of Africa and the Belgian Congo, 3 ft. 3⅜ in. (one metre). Australia uses the 4 ft. 8½ in., the 5 ft. 3 in. and the 3 ft. 6 in. gauges in different states.

GAVIAL, a very large species of crocodile found in the great rivers of India.

GAZELLE, a genus of small antelopes, distinguished by their graceful form and great speed. Most species inhabit the sandy deserts of Africa.

GÉLATINE is the jelly-like substance obtained by boiling bones, skins and hoofs of animals, and carefully clarifying them, to render the product fit for culinary and commercial purposes.

GEMS are precious stones cut and polished, and mounted so as to display their brilliance and beauty; or these or other hard stones engraved as seals, or carved in relief.

GENERAL, an officer of the British Army of the rank next below field marshal. Below "full" general there are, successively, the ranks of lieutenant-general and major-general.

GENESIS, the first book of the Bible, which opens with the Creation (Greek, *genesis*) of the universe, earth and living creatures, and narrates the history of the Fall, the Flood and the Early Patriarchs.

GENEVA CONVENTION, signed at Geneva, on August 22, 1864, by twelve European States and Persia, established rules to be observed in warfare with regard to the treatment of wounded and of military hospitals and their staffs. It adopted a red cross on a white ground for hospitals, ambulances and helpers.

GENTLEMEN-AT-ARMS, members of a corps forming part of the Royal Household—all of them officers of the British Army—who attend important state and court ceremonies.

GEOGRAPHY, the scientific study of the surface, products and inhabitants of the earth. It is usually divided into two main parts. The first of these, concerned with the earth as an inanimate thing, is called physical geography, and confines itself to the shape and size of the various land areas and oceans, their climates, composition and products. This branch is closely allied to geology and includes what may be called mathematical geography, which divides the earth's surface by imaginary lines of latitude and longitude for purposes of reckoning, and geometry, the science of measuring areas. The second great division, political geography, limits itself to a consideration of the distribution of the various human races, their governments, wealth and commerce.

GEOLOGY, the science which deals with the composition and structure of the earth's crust. Besides examining the actual chemical nature of the various components of the crust, it studies the causes and relative ages of strata or layers of rocks of various kinds, and the agencies which have caused their distortion and attrition into mountains, hills, valleys, plains, etc. The geological surveys of countries give us maps which show at a glance what rocks and other strata are found in different districts. By its study of fossils, geology enables us to build up a history of prehistoric animal life, and its mineralogical researches are of great value to the miner.

GEOMETRICAL PROGRESSION, a series of numbers or quantities in which each is the preceding multiplied by the same factor. For example: 2, 6, 18, 54, 162, the factor here being 3.

GEOMETRY, a term meaning literally measurement of the earth, is the mathematical science which deals with the properties of the three dimensions of space, length, breadth and height. Plane geometry is concerned with length and breadth, that is, area, only; solid geometry with length, breadth and thickness, that is, solids. The first great work in geometry was that of Euclid, whose *Elements* were published in the third century B.C.

GEORGE CROSS, a decoration for gallantry, was instituted in 1940. Intended

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

primarily for civilians, but also awarded to members of the Fighting Forces for deeds for which a military honour would be inappropriate, it was bestowed on Malta in 1942 in recognition of the heroic behaviour of its inhabitants. The George Medal, instituted at the same time, is also awarded for acts of bravery.

GERMAN SILVER, a white alloy of nickel, copper and zinc, used for spoons and forks and electrical resistance wires.

GEYSER, a natural fountain of hot water, which bursts forth at intervals. The chief examples occur in New Zealand, Iceland, and the Yellowstone Park, Wyoming. In the last is one which flings water 200 ft. into the air.

GHETTO, the quarter of a medieval town to which Jews were confined. Old Jewry, in London, recalls by its name the Ghetto of the Metropolis.

GHURKAS, a Hindu mountaineer race in Nepal, India. Though of small stature, they are very hardy and make excellent soldiers.

GILT-EDGED SECURITIES are investments, such as Consols, Treasury Bonds and Government Loans, which are regarded as very safe.

GIN, an alcoholic spirit distilled from barley or rye and flavoured with essential oil of juniper and, in some cases, sweetened with sugar.

GINGER, the rhizome or root-like stem of a tropical plant, *Zingiber officinale*. The dried root, ground up, is used in cookery and medicine.

GIRAFFE, or CAMELOPARD, an African quadruped, peculiar for its very long neck and legs, which make it the tallest of all animals. It is found only in Africa, where it goes about in herds. The males attain a height of 18-19 ft. In order to drink or browse on grass it is compelled to stretch its forelegs apart. It feeds chiefly on the smaller branches and shoots of trees.

GIRL GUIDES, an organization founded by Lord Baden-Powell to give girls a training corresponding to that of the Boy Scouts. It was incorporated by charter in 1915, and granted a royal charter in 1923.

GIRONDISTS, members of an idealistic party which arose in the early days of the French Revolution. They formed a ministry in 1792, but were overthrown by the Jacobins and many of them guillotined.

GLACIAL PERIOD, the name given to a period of the earth's history during which the north polar ice-cap increased considerably in size from causes not yet ascertained. Modern geological theory holds that there have been at least four glacial periods, alternating with temperate, and even tropical, periods.

GLACIERS, slowly-moving "rivers" of snow compressed into ice, which, where they discharge into salt water, break off in masses called icebergs. Outside the polar regions, glaciers melt when their lower ends reach an altitude where the temperature is below freezing-point.

GLANDS are organs of the body which secrete fluids having different purposes. They vary in size from the liver to the tiny sweat glands in the skins.

GLASGOW UNIVERSITY, founded in 1450, is the second oldest of the Scottish universities. It includes a college for women, Queen Margaret's College, founded in 1883.

GLASS is a combination of silica, in the form of sand, with at least two metals, one of which must be alkaline. The two main classes of glass are flint glass and crown glass. The first is composed of sand, red lead and potassium carbonate, and is used chiefly for the manufacture of tumblers, other table ware and cut-glass articles. Crown glass, containing sand, lime and carbonate of sodium, is employed in the manufacture of window glass and plate glass. A cheap form of the second variety is made for bottles. In the manufacture of most glasses the materials named have a certain amount of cullet, or waste glass of the same kind, added during the melting in the glass furnace. Special glasses are manufactured for optical purposes, and for withstanding great heat; and, in recent years, a window glass, so constituted that it passes rays at the violet end of the spectrum more readily than those at the red end, has been much used for windows.

GLIDING may be defined as the science of moving through the air in a heavier-than-air machine not provided with a motor and called a glider. The glider depends for forward motion on gravity, and, for attaining altitude, on upward air-currents. Gliding preceded and prepared the way for mechanical flight, which for a time caused it to be neglected. The absence of an engine makes a glider very light relatively to its wing area. Gliders towed by aeroplanes were employed extensively as troop carriers during the Second World War. The Hamilcar glider, weighing nearly 15 tons when loaded, carried a tank or guns.

GLOVES, to protect the hands against cold, injury or dirt, have been in use probably for thousands of years. Leather gloves—with the hair left on where great warmth is needed—constitute the most important branch of glove-making; but in recent times the woven fabric glove has

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

become a dangerous rival to the cheaper grades of leather glove. Rubber gloves are worn to protect the hands against liquids which stain or injure the skin; and in the steel industry asbestos gloves are used by men exposed to intense heat.

GLOW-WORM, a species of beetle which emits light from its body. In the British species the wingless female is far more luminous than the winged male.

GLUCOSE, a sugary substance obtained from starch and occurring naturally in ripe fruit and honey; used in making confectionery. Also called dextrose.

GLUE, a powerful adhesive obtained by boiling skins, hoofs, bones, etc.

GLYCERINE, a sweet, colourless, syrupy liquid obtained from fats and oils, and used in medicine, and in many industries, including the manufacture of explosives.

GNOSTICS, philosophers of the first century A.D., whose doctrines were a mixture of ancient mythology, eastern beliefs and the Jewish and Christian religions.

GNU, or WILDEBEEST, a large African antelope, with a head like a cow's, a tail like a horse's and long, curiously-shaped horns, bending downwards and then upwards and forwards.

GOAT, a cloven-footed animal, closely related to the sheep, found in all but the coldest parts of the world. Goats are extremely agile and hardy creatures, and manage to pick up a living where most other herbivorous animals would starve. The Angora and Kashmir species yield long, silky hair valued for weaving. Domestic goats are kept chiefly for their rich milk.

GOAT-MOTH, the second largest of British moths, the caterpillar of which has an unpleasant goat-like smell, and damages trees, especially willows, by boring into them.

GOBELIN TAPESTRY, the products of a factory established at Paris by a family named Gobelin, which also owned dye-works. The tapestries soon became famous, and in 1662 the factory was bought for Louis XIV, who employed famous painters to prepare new designs.

GOLD has been valued for its beauty and other qualities since the earliest days of civilization, and its comparative scarcity has made it for thousands of years one of the chief mediums of exchange, either coined or uncoined. Its two most valuable physical qualities are its malleability—exceeding that of any other metal—which enables it to be beaten out into sheets only 100,000th or less of an inch thick; and its freedom from corrosion, which makes it ideal for protecting and ornamenting other metals and materials. Gold was first brought to Europe in large quantities from the New World, in the sixteenth century, by the Spaniards. In 1848 large deposits were discovered in California, and three years later the goldfields of Australia began to be opened up. Since 1886 the Witwatersrand, in the Transvaal, S. Africa, has been the chief source of the world's gold supply. The annual production of gold is now about 20,000,000 oz. Gold occurs in a pure form, as dust and nuggets, in river beds; and alluvial gold, as it is called, constituted most of that obtained from the Californian and Australian "diggings." Nowadays most of our gold is derived from gold-bearing ores, which are pulverized and treated chemically to separate the gold.

GOLDBEATER'S SKIN, the outer layer of part of the large intestine of the ox. It is very tough, and on this account is used in the beating out of gold-leaf; while its imperviousness and lightness render it ideal for lining the gas-bags of airships.

GOLD STANDARD.—The currency of a country is said to be on the gold standard if it is by law exchangeable for gold on a fixed basis. The gold standard is in effect an international device for keeping the relationships of national currencies—in pounds, francs, marks, etc.—as constant as possible, by linking them all to a common substance.

GOLDEN AGE, an imaginary epoch of human history, in which everyone was innocent, happy and prosperous. The words are used figuratively of a period during which commerce, art or literature, etc., reached its zenith. Thus, the times of Elizabeth were the golden age of English drama and poetry.

GONDOLA, a long, narrow boat with high ends, used on the Venetian canals. It is often propelled by a single oar pushed by a boatman standing at the stern.

GOODWIN SANDS, extensive and dangerous sandbanks off the Kentish coast, the scene of many wrecks.

GORDON RIOTS.—In June, 1790, a large mob, headed by the fanatical Lord George Gordon, marched to Westminster to protest against Acts freeing Roman Catholics from political disabilities. The rioters had London at their mercy for five days, during which they did immense damage, and were not dispersed until many of them had been killed by troops called out to quell them.

GORGONS, three winged sisters of Greek mythology, with snakes on their heads in place of hair. One of them, Medusa, was able to turn men into stone by looking at them. She was slain by Perseus.

GORILLA, the largest and most powerful of the apes, an inhabitant of equatorial

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

African forests. The male stands 5-6 ft. high. If caught young, gorillas may become in some measure domesticated.

GOSHAWK, a large hawk which is still found in some parts of Britain. In olden days it was used in falconry.

GOTHENBURG SYSTEM, a system applied to the sale of intoxicating liquors in Gothenburg, Sweden, in 1865, and since adopted, in a more or less modified form, in other places. Under it, public houses are placed under the control of a company which is permitted to make only a limited profit.

GRAMME, the unit of weight in the metric system, equal to 15.43 English grains. It is the weight of a cubic centimetre of distilled water at maximum density.

GRAMOPHONE, an apparatus patented in 1887 by Emile Berliner, for reproducing sounds by means of a needle running in a spiral groove in a revolving disc. The movements imparted to the needle cause a diaphragm to vibrate directly and create sound-waves, or give rise to variations in an electric current, which are magnified and reproduced as sounds by a loud-speaker.

GRAMPUS, or KILLER WHALE, is the largest species of dolphin, measuring up to 25 ft. in length. It is very ferocious, and combines in packs to destroy the large whales.

GRAND NATIONAL, the greatest of horse steeplechase races, run in March at Aintree, Liverpool, over a distance of 4 miles 856 yards. The large number of formidable obstacles makes it the most gruelling of all important horse-races.

GRAND PRIX, LE, the French horse race which corresponds in importance to the English "Derby." It is run at Longchamps, Paris, over a course of 1 mile 7 furlongs, in June, and is open to three-year-olds of all countries.

GRAPE-FRUIT, POMELO or SHADDOCK, a tropical fruit having the shape of an orange (though considerably larger) and the colour of a lemon, to which it is related. Much appreciated for its pleasant acid flavour.

GRAPHITE, PLUMBAGO or BLACKLEAD, a very fine dense form of carbon, found in masses among rocks, and used in drawing-pencils, for lubrication, for polishing cast iron and as material for crucibles.

GRAVITATION, the attractive force which all particles or bodies of matter exert on one another. Gravitation gives matter what is called weight. The proving of the universality of gravitation by Sir Isaac Newton in 1686 is regarded as among the greatest of all scientific discoveries.

GRAYLING, a river fish of the salmon family, distinguished by its large purple dorsal fin, grey stripes on the sides, and projecting upper lip.

GREAT BRITAIN includes England, Scotland and Wales. It has an area of 88,748 sq. miles; and at the census of 1931 had a population of 44,790,485.

GREBE, a water bird which frequents lakes and rivers. There are several species, all practically tailless, but only one of them, the small grebe, or dabchick, is at all common in England. It builds among reeds at water level, and is careful to cover its eggs over before leaving the nest.

GRETNA GREEN, in Dumfriesshire, just north of the Border, is famous for its smithy, in which many runaway couples from England were married under Scottish law by the blacksmith. Such marriages were rendered legally invalid after 1856, unless one party had resided 21 days previously in Scotland.

GRILSE, a salmon which has been to the sea once and returned to fresh water to spawn, but is not yet full-grown.

GRINDERY, the nails, brads, leather, tools and other materials needed by a shoemaker or other worker in leather.

GROUSE, a family of game birds related to the ptarmigan and partridges, of which three species are found in the British Isles: Black grouse, or black game; red grouse; and capercailzie. The last is much the largest and rarest of the three; and, unlike the other two, frequents trees.

GRUB STREET, now Milton Street, in the City of London, was at one time the haunt of poor authors.

GRUNDY, MRS., a character in Thomas Morton's play, *Speed the Plough* (1798), who now personifies social proprieties.

GRUYERE, a cheese made in Switzerland and France, distinguished by the large globular holes in it.

GUANO, the consolidated droppings of sea-birds, found in deep deposits on isolated islands. It is valuable as a fertilizer, containing both nitrates and phosphates.

GUELPHS, or GUELFS, a party which, during the eleventh to the fourteenth centuries, supported the Pope in Italy and Germany, in opposition to the Ghibellines, the aristocratic and imperial party.

GUILDHALL, THE, the civic palace of the City of London, which is the scene of the Lord Mayor's Banquet on November 9. In its Great Hall the Lord Mayor, Sheriffs and Members of Parliament for the City are elected. The present building is the successor of an earlier Guildhall destroyed in the Great Fire (1666). It too was damaged by bombing during the Second World War. It has a library, a museum and an art gallery.

GUILDS are associations formed to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

encourage and protect some particular craft or trade. In the Middle Ages they were very powerful, creating practical monopolies. The Livery Companies of the City of London originated in old guilds.

GUILLEMOT, a sea-bird with dark upper and white under-plumage, web-footed and very skilful in pursuing fish under water. Two species are found in the British Isles.

GUILLOTINE, a tall frame in which a heavy knife falls, used for beheading people condemned to death. Named after its inventor, Dr. J. I. Guillotin, it was adopted in the French Revolution for executing political prisoners, and has been retained in France for the execution of criminals.

GUINEA, an English gold coin worth 21 shillings when its use ceased in 1817. The first coins of the name were made in Charles II's reign from gold brought from the Guinea Coast of Africa.

GUINEA PIG, or CAVY, a small rodent, a native of S. America. Introduced into Europe in the sixteenth century.

GULF STREAM, a warm current in the N. Atlantic, which flows from the Gulf of Mexico northwards along the east coast of the United States and then takes a N.E. direction to the British Isles and western shores of Europe. The mildness of our climate is due largely to the warmth of the Gulf Stream.

GUN-COTTON, a powerful explosive made by treating cotton with sulphuric and nitric acids.

GUNPOWDER, first used in warfare in Europe during the thirteenth century, is a mixture of charcoal, saltpetre and sulphur. The larger the grain, the slower is the powder's action. For military and sporting purposes gunpowder has been replaced by "smokeless" powders of different composition, but it is still used in large quantities in mines and quarries for blasting.

GUNPOWDER PLOT, a conspiracy in which a number of Roman Catholics, headed by Robert Catesby, took part to blow up the Houses of Parliament on November 5, 1605, when King James I was to open Parliament in person. A warning given by one of the conspirators to Lord Monteagle led to the cellars being searched, the discovery of many barrels of gunpowder, and the capture of Guy Fawkes, who had been entrusted with firing the powder.

GUTTA PERCHA, a substance much like india-rubber, with which, however, it must not be confused. It is tapped from the bark of certain trees as a milky fluid, which thickens on exposure to the air. It is used, either pure or mixed with rubber, as an insulator for electric conductors, especially in submarine cables, and has many other commercial applications.

GUY'S HOSPITAL, one of the great London hospitals, was founded in 1721 by Thomas Guy, a bookseller who made a large fortune by successful speculating. It has some 500 beds.

GYMNASIUM, a building or chamber provided with apparatus for exercising the body. In ancient Greece, gymnasia were places in which physical exercises were combined with mental training and teaching. In Germany the word now signifies a secondary or high school.

GYROSCOPE, or GYROSTAT, a disc on a spindle mounted in a framework which allows it to tilt freely in any direction. When the disc is spun rapidly, the spindle resents being tilted out of its original direction, hence the toy called the gyroscopic top will lean over without upsetting in a manner which seems to defy gravitation. What may be called the reluctance of the gyroscope to accommodate itself to outside forces is utilised in the gyroscopic compass (*see* GYROSCOPIC COMPASS), in apparatus for steering torpedoes and ships, and in instruments which enable an airman to tell, in darkness or fog, whether his machine is level laterally and horizontally. In a very enlarged form it is used for stabilizing ships, that is, limiting their roll in rough weather. Huge discs, weighing up to 100 tons each, are kept spinning at high speed by electric motors. When the ship begins to roll, the spindles of the discs are tilted either fore or aft, as the case may be, by mechanism controlled by auxiliary gyroscopes; and this causes the main gyroscopes to exert a tremendous force laterally which "kills" the roll at a very early stage.

GYROSCOPIC COMPASS, or GYRO-COMPASS, a form of gyroscope so mounted that, if kept spinning at a very high speed—up to 20,000 revolutions per minute—its axis, set to points N. and S., is compelled to maintain its direction in all circumstances. A compass card is attached directly to it; or the apparatus may be made to control electrically a number of "repeating" compasses in different parts of a ship, as well as steering apparatus which automatically keeps the ship on a set course.

HABEAS CORPUS ("That you may have the body"), a writ issued by a judge ordering that a prisoner be produced in court. The Habeas Corpus Act, passed in 1679, is one of the great safeguards of the personal liberty of the citizen.

HAIL, frozen rain, or pellets of ice, created by moist air being carried upwards

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

very quickly into much colder air. In tropical countries hailstones attain a weight of several ounces.

HAIR, the body-covering of most mammals, designed to protect the skin and keep the body warm. Each hair grows out of a tiny pit, called a follicle, in the skin. Hair is composed of the same material as the nails. The stiff whiskers of the cat tribe act as feelers. Manes and ruffs are partly ornamental and partly protective. In many animals hairs are provided with muscles which erect them, or make them "stand on end," when the animal is frightened or wishes to look formidable. (*See* FUR.)

HAKE, a sea fish of the cod family, valuable for eating.

HALIBUT, the largest of the flat-fish, which attains a length of up to 8 feet. It is highly esteemed as a food-fish.

HAMSTER, a burrowing rodent abundant in Germany and other parts of Europe, which does much damage to grain crops.

HARE, a rodent common in England, and related to the rabbit, though it is much longer. It is distinguished by its long ears and long hind legs. Its great speed is matched against that of the greyhound in coursing.

HAREM, the part of a Mohammedan house reserved for the exclusive use of the female members of the household.

HARPSICHORD, a musical stringed instrument played by a keyboard. It was one of the immediate predecessors of the piano. The strings were sounded by being plucked by quills attached to the keys.

HARROW SCHOOL, one of the greatest of English public schools, at Harrow-on-the-Hill, Middlesex. It was founded in 1571 by a yeoman farmer, John Lyon, who obtained a royal charter for it from Queen Elizabeth. The school headgear is a flat straw hat of somewhat peculiar shape; the school motto, "Stet fortuna Domus" (May the good fortune of the House endure); and the most famous of its songs, "Forty years on."

HARVARD UNIVERSITY, one of the oldest and greatest of the universities of the United States, is at Boston, Massachusetts. It originated in 1636, and received its name in 1639 from the Rev. John Harvard, an Englishman, who left it half of his estate.

HARVEST BUG, or HARVEST MITE, a very small mite which burrows under the skin and causes great irritation.

HEART, the organ which causes the circulation of blood through the body and lungs. It receives purified blood from the lungs and drives it into the arteries for distribution. On its return through the veins, it passes it back to the lungs for repurification and oxidation. It is in effect a muscular pump, making about 75 strokes a minute, and in an adult expelling 5-6 cubic inches of blood at every stroke.

HEAT is a form of energy produced by mechanical, electrical, or chemical action. Wherever resistance is overcome, heat is generated. Heat can be transformed, through the medium of engines, into mechanical work, electricity, or light. It causes the expansion of substances by driving their molecules farther apart, and is able to break down the cohesion of solids till they become liquids, and convert liquids into gases. At the centre of some of the hottest stars, heat is so intense as to produce the disintegration of the atom.

Heat is transmitted by radiation, as from the sun to the earth; or by conduction, through the substance of a rigid body; or by convection, as when a body of air or water is warmed by movements which bring its parts successively into contact with hot surfaces. (*See* THERMOMETER.)

HECATOMB, the sacrifice of 100 bulls at an ancient Greek religious ceremony. The word is now used of any great slaughter of animals or human beings.

HECTOR, son of Priam, King of Troy, was the leader of the Trojans in the defence of their city against the besieging Greeks. He was killed in single combat by Achilles.

HEDGEHOG, a small insect-eating mammal, having the hairs on its back and sides developed into sharp spines, which effectively protect it when it rolls itself up into a ball. It hibernates in winter.

HEJIRA, or HEGIRA, the flight of Mohammed for safety from Mecca to Medina in A.D. 622, after he had declared himself the Prophet of God. On the date of the flight, which is variously given as July 16, September 13 and September 20, the Mohammedans base their chronology.

HELIOGRAPH, an instrument with which signals are sent by flashing the sun's rays from a mirror, mounted on a tripod and operated by a key.

HELIOTROPE, or CHERRY PIE, a plant with clusters of very sweet-smelling purple flowers, grown usually under glass when cultivated in Britain.

HELIUM, one of the elements, next to hydrogen the lightest of gases. Named after the sun (Greek *helios*), in which it was first detected by the spectroscope. It is derived from natural gas and, being non-inflammable, was used for inflating airships.

HEMP, a plant related to the nettle, the stem of which yields a tough fibre

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

used for ropes and canvas. The seed is used as food for birds.

HERALDRY, a pictorial method of showing the descent and, to a limited extent, the history of a family. The medieval knight carried his heraldic coat of arms on his shield. The inter-marriage of families is shown by blending two or more coats of arms in one charge.

HERALDS' COLLEGE, Queen Victoria Street, London, is the headquarters of heraldry in England. It is presided over by the Earl Marshal, who has under him three kings-of-arms, six heralds and four pursuivants. Besides taking part in state ceremonies, the heralds trace pedigrees and grant coats-of-arms.

HERBIVORA, all quadrupeds which live on grass and other vegetable foods. They are also termed ungulates, or hoofed animals.

HERMIT, one who lives apart from human society, to devote himself to meditation. In the third century A.D. great numbers of persecuted Christians lived as hermits in Egyptian deserts.

HERON, a family of wading birds, related to the storks, with very long legs, neck and beak. There is one British species, the common heron.

HERRING, one of the most important of sea fish on account of its abundance, nutritiousness and good flavour. It is related to the pilchard and anchovy. Great shoals appear in the North Sea in the latter half of the year, and the fish are taken in huge numbers by drift nets, in the meshes of which they entangle their heads. Herrings are eaten fresh, or cured in different ways, as kippers, bloaters, red herrings and salted herrings.

HIBERNATION, passing the winter in sleep or torpor, is common among animals and reptiles in countries where the winter is severe. In Britain squirrels, dormice and hedgehogs hibernate.

HICKORY, an American tree which yields a tough wood used for tool handles.

HIEROGLYPHICS, pictorial symbols used to represent ideas or sounds in ancient Egyptian inscriptions. Their interpretation was made possible by the discovery of the Rosetta stone in 1799. (*See* ROSETTA STONE.)

HIGHEST BUILDINGS.—The Palace of Soviets, Moscow, is planned to be 1,365 ft. high. The four highest in New York are: the Empire State Building, 1,248 ft.; Chrysler Building, 1,030 ft; Bank of Manhattan, 925 ft.; Woolworth Building, 792 ft. The Eiffel Tower, in Paris, is 984 ft.

HIGHEST RAILWAYS.—The Peruvian Central Railway attains altitudes of 15,860 and 15,665 ft.; the Antofagasta and Bolivia Railway, altitudes of 15,834 and 15,809 ft.; the Peruvian Southern Railway, one of 14,670 ft. These are all "adhesion" railways. Among rack mountain railways first place is taken by that ascending Pike's Peak, in the Rocky Mountains, which reaches an elevation of 14,147 ft.

HINDU, one whose religion is Hinduism. There are about 255,000,000 Hindus in India and Pakistan, etc., and about 500,000 in Africa and America.

HIPPOPOTAMUS, the second largest of land mammals, is found only in Africa. It has short legs and a curiously broadened snout. Its toes are partly webbed. As its name—"river horse"—implies, it lives almost entirely in rivers and lakes. It eats grass and other vegetation.

HITTITES, a race of obscure origin which occupied Canaan before the Israelites and developed a powerful empire in Asia Minor about 1520 B.C. They were overwhelmed by the Assyrians in the eighth century B.C.

HOGSHEAD, a statutory liquid measure of 52½ imperial gallons. A cask called a hogshead may be of different capacities, according to the commodity contained.

HOLLY, an evergreen tree of the ilex family. It is distinguished by its prickly leaves, and by its bright red berries, which make it a favourite Christmas decoration.

HOLY ALLIANCE, an agreement between Russia, Prussia and Austria, signed at Paris in 1815, under which they bound themselves to base their home and foreign policies on Christian principles. It failed to achieve its object and ended in 1830.

HOLY GRAIL, the dish or cup used by Christ at the Last Supper. Its quest by Sir Galahad and Sir Percivale forms the subject of one of the most beautiful of Tennyson's *Idylls of the King*.

HOLYROOD HOUSE, Edinburgh, originally an abbey, was afterwards the residence of the Scottish sovereigns. It was built in 1501; was the scene of the murder, in 1566, of Rizzio, favourite of Mary Queen of Scots, and is still one of the royal palaces of the sovereign of Britain.

HOLY WEEK, or PASSION WEEK, begins on Palm Sunday, and ends at midnight of Easter Eve.

HOME GUARD, originally called the Local Defence Volunteers. This defence force was formed in May, 1940, when an invasion of Britain by Germany seemed imminent. The name was changed in July, when its members numbered over 1,300,000, and included British subjects between the ages of 17 and 65. The Service was unpaid and part-time. Lamentably short of equipment at first, rifles, tommy guns, Smith guns, uniforms and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

steel helmets were issued eventually. A number served with anti-aircraft batteries. The Home Guard "stood down" in 1944. King George VI took the salute in Hyde Park, London, at the final parade on December 3 of that year.

HOME OFFICE, the Government Department presided over by the Home Secretary, which is responsible for the maintenance of law and order within the realm, and enforces laws made for the well-being of the community.

HOME RULE, the principle that a country should have control of matters which concern it alone. The term is associated chiefly with Ireland, which for many years agitated for Home Rule, granted to it by treaty in 1922.

HONEY, the nectar of flowers, collected by bees and deposited in cells.

HONEYDEW, the sweetish, sticky excretion of the aphis (*see* APHIDES). It is most commonly found on lime trees and maples, and is greatly appreciated by ants.

HOOPOE, a bird, a rare visitant to the British Isles, which is remarkable for its large crest, marked with black and white bars.

HOP, a climbing plant cultivated for its cones, which contain a bitter substance used for flavouring beer.

HORIZON, the line in which sky and sea or land appear to meet; the limit of vision. This definition applies to the "sensible" horizon, which at sea is, in clear weather, 9½ miles distant as seen from a point 50 ft. above water level, and 13¼ miles from a point 100 ft. above.

HORNBILL, a tropical bird with an abnormally developed beak. It nests in a hole in a tree, in which the male bird immures the female during incubation by almost closing the entrance with mud.

HORNBOOK, a slab of wood, shaped at one end into a handle, with printed matter on one side, covered with a protective sheet of horn. Hornbooks were used in schools as reading primers until 1700.

HORNET, a large species of wasp, armed with a very formidable sting. The nest is usually attached to a tree or building.

HOROLOGY signifies both the science of measuring time and the art of making machines—clocks and watches—with which to measure it.

HORSE, one of the greatest friends of man, is peculiar physically as having only one toe on each foot, which has developed into a solid hoof. The domesticated breeds are descended from much smaller animals, the remains of which are found in fossil form. Modern horses may be roughly classified as: the heavy and slow draught horse; the racehorse (of Arab descent); the hackney horse, a mixture of the other two; the pony, or diminutive horse; and the cob, intermediate in size between the horse and the pony.

HORSE CHESTNUT.—*See* CHESTNUT.

HORSE GUARDS, a building in Whitehall which is now the headquarters of the London District. An archway leads through it to the Horse Guards Parade behind, an open space of nearly seven acres, where the colour is "trooped" on the King's birthday.

HORSE-RACING was popular among the ancient Greeks and Romans in the form of driving races. In the time of the Roman Empire chariot-racing aroused intense interest and even led to serious conflicts between the partisans of the favourites. Ridden races did not apparently become popular in England till the seventeenth century, when they began to enjoy royal patronage. Horse-racing in England is controlled by the rules of the Jockey Club, a body formed in 1750, which, though it has no legal authority, is all-powerful in the racing world.

HOTTENTOTS, an aboriginal race of South Africa, of small stature and low mentality, employed as herdsmen and drivers of ox-wagons.

HOUSEHOLD TROOPS are the Life Guards, Royal Horse Guards and the Foot Guards.

HOWITZER, a short-barrelled cannon, used for discharging shells at a high angle to fall into trenches or other fortifications. The calibre varies and includes weapons of 6 in., 9.2 in. and 15 in. A later development was the British 25-pounder gun-howitzer, which combined the advantages of both weapons.

HUGUENOTS, the French Protestants of the sixteenth to eighteenth centuries. They were greatly persecuted by the Catholic party, and many emigrated to England after the revocation, in 1685, of the Edict of Nantes, which in 1598 had granted them toleration.

HUMANE SOCIETY, ROYAL, founded in 1774, awards medals for the rescue, or attempted rescue, of persons in danger of being drowned or suffocated by gases.

HUMMING BIRDS, so called from the noise which they make with their wings, are found in all countries of the New World, and especially in Central America. They have long slender beaks, and long tongues which they dart into flowers. Many of them are brilliantly coloured, and some are the smallest of all birds.

HUNDRED DAYS, the period which began on March 20, 1815, when Napoleon escaped from Elba, and ended on June 28 following, with the restoration of the Monarchy after Waterloo.

HUNDRED YEARS' WAR is the name

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

given to the series of conflicts between England and France lasting from 1338 to 1453. It included the battles of Crécy, Poitiers and Agincourt, and when it ended Calais was the only English possession left in France.

HUNS, an Asiatic Tartar race which swept over Europe in the fourth and fifth centuries. They were disastrously defeated under Attila at Châlons, near Paris, in A.D. 451, by the Romans and Visigoths.

HURRICANE, a tropical cyclone of great intensity.

HYDRAULIC PRESS, perfected by Joseph Bramah in 1795, consists of a cylinder with a plunger which is forced outwards by a liquid pumped in. Objects placed between a plate mounted on the plunger and another plate stayed to the cylinder can be subjected to great pressure.

HYDRAULIC RAM, a device which, by the sudden checking of a flow of water through a pipe, causes some of the water to be lifted to any required height.

HYDROCARBONS are chemical combinations of hydrogen and carbon. They include many gases, the various substances derived from petroleum, and many products of coal.

HYDROCHLORIC ACID, chemically chloride of hydrogen, is named commercially spirits of salts. It fumes when exposed to the air and attacks zinc vigorously. It is used in many manufactures and in medicine.

HYDROGEN, a colourless, odourless gas, the lightest of the elements. It is the standard to which the specific gravities of other gases are referred. It burns with a very hot and almost invisible blue flame, is present in all acids and is one of the two constituents of water.

HYDROMETER, an apparatus for measuring the density of a liquid. The simplest form, used for testing the acid in electrical accumulators, is a glass float with graduated neck.

HYENA, a carnivorous animal found in Africa and S. Asia, which lives largely on carrion and the remains of animals killed by the large beasts of prey. It is an ugly, cowardly creature.

HYGROMETER, an apparatus for measuring the moistness of the atmosphere. There are many forms. One consists of two thermometers, one of which has the bulb enveloped in moistened muslin. Evaporation causes chilling, which is more pronounced the drier the air is. Hence atmospheric moistness is shown by the difference between the readings of the two thermometers.

HYMENOPTERA, an order of insects having four transparent wings, two larger than the others. It includes the bees and wasps, which, like other insects of the order, have a thin "waist" between thorax and abdomen.

HYPNOTISM, an artificially produced sleep or state of unconsciousness, during which the subject may be insensitive to pain, respond to any suggestion made by the hypnotizer, and perform feats impossible under ordinary condition. Hypnotism has been found useful in the treatment of mental disorders.

HYRAX, a somewhat rabbit-like animal, found in Africa and Asia, which lives in trees, and is hunted for its fur. It utters a peculiar cry at night.

IBIS, a bird of the stork family, common in Central Africa. One species was a sacred bird among the ancient Egyptians.

ICE, water solidified by cold. Snowflakes are ice crystals, which, if subjected to pressure, become solid ice. It is lighter than water, because water attains its maximum density at 39.2° F., and then expands until freezing-point at 32° F. Ice therefore floats and protects the water beneath from intense cold; otherwise many seas would be frozen solid in winter. This quality, though very valuable climatically, is responsible for the bursting of water pipes during frost; on the other hand, it does valuable service in pulverizing rocks and the soil. Much of the ice used in refrigerators and for cooling beverages in summer is now produced artificially. (*See* REFRIGERATION.)

ICE AGE.—*See* GLACIAL PERIOD.

ICEBERGS are huge masses of ice, broken off from the lower ends of glaciers, and floating in the sea. About one-ninth of the mass of an iceberg is unsubmerged in salt water. In the Arctic, Greenland and Alaska are the two great sources of icebergs; in the Antarctic great numbers break away from the Great Ice Barrier in Ross Sea. While they float north or south, as the case may be, they gradually melt away, but in the meanwhile they are a serious danger to shipping.

ICEBREAKERS are steamships specially designed for forcing their way through ice-floes and keeping channels open for other vessels. They have greatly strengthened bows and sides, and bows so shaped as to crush through the ice by sheer weight.

ICHNEUMON FLY, a four-winged insect, with a long, thin body. There are several different species in the British Isles alone. The flies destroy vast numbers of caterpillars by laying their eggs in them, thus providing food for the larvæ.

ICHTHYOLOGY, the branch of biology concerned with the study of fishes.

IDES, in the ancient Roman calendar, was the thirteenth day of the months,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

except March, May, July and October, in which it was the fifteenth day.

"ILIAD," the great Greek epic poem, attributed to Homer, which describes in 24 books the siege of Ilium (Troy) by the Greeks, and the fighting round the city.

IMAM, a Mohammedan priest who leads the prayers of a congregation.

IMPERIAL CONFERENCE, a gathering at which ministers representing the United Kingdom, Canada, the Commonwealth of Australia, New Zealand, the Union of South Africa, the Irish Free State, Newfoundland and India discussed matters relating to the Empire as a whole. These Imperial Conferences, which were held in 1911, 1917, 1918, 1921, 1923, 1926, 1930 and 1946, carried on the purpose of earlier "Colonial" Conferences. In July and August, 1932, an Imperial Economic Conference was held at Ottawa, to stimulate trade between the Empire.

IMPERIAL INSTITUTE, South Kensington, was opened in 1893, as a memorial of Queen Victoria's 1887 Jubilee, in which were to be displayed the commercial and industrial resources of the Empire. It has a number of departments devoted to various kinds of products, a permanent exhibition of collections, and a cinema and lecture hall.

IMPERIAL WAR MUSEUM, Lambeth, opened at South Kensington in 1924, contains naval and military trophies and photographs, etc., of the First World War. Damaged by bombing in the Second World War, of which it contains relics.

IMPRESSIONISM in art is a vague term very difficult to define, but may generally be regarded as a revolt against over-faithful copying of outside appearances and a movement in favour of bringing out the essential features and spirit of the subject represented.

INCAS, the hereditary rulers of Peru during the 500 years preceding the conquest of that country by the Spaniards in 1532. They claimed to be descended from the sun.

INCENSE, a mixture of gums and balsams which, when heated, emits a penetrating odour, used in religion.

INCREMENT, UNEARNED, the increase in the value of land due, not to anything done by the owner, but to outside causes, such as the extension of a town near it which stimulates the demand for land to build houses on.

INCUBATION, the hatching out of eggs, occupies a number of days which varies with different varieties of birds. The period of incubation is 21 days for the domestic fowl, 28 days for ducks and turkeys, 30 days for geese.

INDEX LIBRORUM PROHIBITORUM, issued officially by the Roman Catholic Church, of books which are forbidden altogether, or permitted only in editions from which offensive passages have been removed.

INDIAN MUTINY, THE, was a military revolt against British rule in India encouraged by recent disasters in Afghanistan and the Crimea. The issue of cartridges, reported to be greased with animal fats, fired the train of discontent. Trouble began in March, 1857, and open revolt of the Sepoys took place at Meerut, in May, and spread quickly to Delhi, Cawnpore and Lucknow. The recapture of Delhi from the mutineers in September was followed by a series of successes by British and loyal native troops which brought the Mutiny to an end early in 1858. As a result of the rebellion the administration of India was transferred from the East India Company to the Crown.

INDIA-RUBBER is the milky exudation, called latex, from the bark of certain orders of trees and shrubs which grow in moist tropical districts. When the bark is cut or "tapped," the latex oozes out. On hardening it possesses the valuable qualities of elasticity and of resistance to water, the passage of electricity, and the action of many chemicals.

Until early in this century practically all raw rubber—to use the more usual shortened term—came from the forests of Brazil, where natives tapped trees of the *Hevea Braziliensis.*

With the increase in the numbers of bicycles and motor cars the demand for rubber by manufacturers of tyres increased so much that the price rose sufficiently to encourage the planting of rubber trees in Malaya, Ceylon and the East Indies, and since then "plantation" rubber has formed the bulk of the world's supplies.

In a plantation the trees are not tapped until six or more years old. The bark is then pared away on an orderly system which gives time for it to renew itself by the time a second tapping of the same part is due. The pails of latex collected by coolies are emptied into a tank, which is kept well stirred while sufficient acetic acid is added to coagulate the rubber into thick slabs. These are passed through rollers, while flooded with water, and thinned into sheets of "crêpe" rubber, which may be either dried by currents of air, or exposed to smoke and converted into what is called "smoked sheet."

On reaching the factory the raw rubber, which is soft and plastic, is kneaded in mills with sulphur and other substances. In this condition it is still plastic and can be rolled into sheets or moulded into any desired form. But when heated—usually

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

under pressure—it undergoes vulcanization, that is, the chemical combination of the sulphur with the rubber. This robs it of its plastic character, and makes it truly elastic; that is, able to regain its original form when stretched or otherwise distorted. Its other properties remain unaltered. By increasing the proportion of sulphur greatly the hard, brittle substance known as *vulcanite* or *ebonite*, which takes a very high polish and is very valuable to the electrician, is obtained.

INDIGO, a dark blue dye, obtained from certain plants of which the Indian *Isatis tinctoria* is the most important. Natural indigo has been replaced to a very great extent by synthetic dyes of the same colour.

INDUCTION, in the sense of a process of reasoning, is usually defined as the building up of a general truth out of a number of particular instances. As an electrical term it signifies the production of an electrical state in one body by another body not in actual electrical contact with it. Thus, magnetism is induced in the core of an electro-magnet by the current passing through the surrounding coil.

INDULGENCE, DECLARATION OF, a decree issued by James II in 1687, on his own authority, to suspend the penal laws against Roman Catholics and Nonconformists. It met with much opposition, and when James reissued it the following year and ordered it to be read in all churches many clergy refused, and the bishops presented a petition against it. Seven bishops were arrested, tried and acquitted.

INERTIA is the inability of matter to alter its state of motion or rest without the application of an outside force. The inertia of a moving train compels it to continue moving after steam or current has been shut off, and that of a stationary train opposes its being set in motion.

INFALLIBILITY, or freedom from the possibility of error, was long claimed by the Pope on doctrinal matters before it was made an article of faith definitely by a council held at Rome in 1870, after bitter controversy.

INFUSORIA, tiny living organisms or protozoa which appear when hay or other vegetable or animal matter is steeped in water.

INGOLDSBY LEGENDS, an inimitable series of humorous poems written by the Rev. R. H. Barham, a minor canon of St. Paul's, and published 1837-1840. Some of them are adaptations of old French legends.

INKS are specially prepared stains for use in writing and printing. Ordinary writing ink contains gum, while printing inks contain linseed oil.

INNS OF COURT, the four institutions, Lincoln's Inn, Gray's Inn, Inner Temple and Middle Temple, which admit law students and call them to the Bar.

INOCULATION, the injection into the body of certain products of a disease to protect it against the disease itself, or render the disease less virulent. Used first for smallpox, it has been extended, by Pasteur and others, to many other diseases and complaints, including anthrax, rabies, cholera, dysentery and catarrh.

INQUISITION, THE, a tribunal instituted by the Roman Church in 1248 to track out and punish heresy. It was introduced into Italy, Spain and Germany, where for several centuries it wielded great power; and was introduced by the Spanish conquerors into the New World. Under Spanish rule it practised many cruelties and sentenced many thousands of people to death.

INSECTS, a very large class of animals which are distinguished by having the body in three parts—head, thorax and abdomen; by six legs attached to the thorax; and by a pair of antennæ or feelers projecting from the head. All are reproduced from eggs, and many of them, after hatching, pass through a larval (caterpillar) and a pupal (chrysalis) stage, before attaining the final stage, in which many have wings.

INSTINCT is an inherited power, apart from reason, which controls the behaviour of animals. It enables birds to construct their nests, bees their cells, spiders their webs, without previous experience.

INTAGLIO, the process of engraving which sinks the design below the surface, as in a seal. If pressed into a soft surface, an intaglio creates the design in relief.

INTERDICT, PAPAL, a ban under which the Pope debarred a person or country from the ministrations of the Church and clergy. England was laid under an interdict in John's reign, and while it lasted there were no religious services or Christian baptisms, marriages nor burials.

INTEREST, payment made for the use of borrowed money, at an agreed rate. *Simple* interest is paid as it falls due—yearly or half-yearly. Where money carries *compound* interest, the interest is not paid out, but added to the original sum, and itself carries interest.

INTERNAL DEBT is that part of a national debt represented by loans raised at home, as opposed to money borrowed from other countries.

IODINE, a black crystalline element, obtained from seaweed and natural deposits

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of potash, and used in medicine and the manufacture of dyes.

IPHIGENIA, in ancient Greek legend, the daughter of Agamemnon and Clytemnestra; sacrificed by her father to appease the goddess Artemis when the Greek expedition against Troy was about to set sail.

IRELAND, an island of nearly 32,000 sq. m., and containing some 4¼ million people, which lies to the west of Great Britain. Northern Ireland, consisting of the counties of Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone, is a part of the United Kingdom, although it has its own parliament in addition to members at Westminster. The rest of Ireland is known as the Irish Republic. In 1948 this portion severed its last ties with the Commonwealth.

IRIDIUM, one of the elements, a rare white metal, used for tipping pen nibs and for standard weights and measures. It is very hard and able to stand great heat.

IRIS (1) in Greek mythology, a goddess who acted as messenger of the gods and was associated with the rainbow. (2) The circular screen in front of the lens of the eye, surrounding an opening called the pupil, which expands or contracts to regulate the amount of light admitted. (3) A large genus of plants, many species of which are grown in gardens.

IRON, the most useful of metals, occurs naturally in combination with other elements as ores, from which it is separated by great heat (*see* BLAST FURNACE). Most of the annual production of iron is converted into steel (*see* STEEL). The rest is used as cast iron for casting, or worked into wrought iron for forging. Owing to the readiness with which it rusts or corrodes there is a great annual wastage of the metal, calculated at many millions of tons.

IRON AGE, the period in the history of a race during which it learned how to smelt and forge iron, and to use tools and weapons made of it in place of those of bronze, previously used.

IRONWOOD, the name of several different kinds of trees, the timber of which is exceedingly hard. The hardest is Indian ironwood, which is too tough to work with ordinary tools.

IRRIGATION, the leading of water on to land through artificial channels, has been practised for thousands of years in hot countries where the rainfall is too small to render the soil productive. It is possible only where there is a large river, fed by rain or snow on distant mountains, flowing through the country. Vast areas of China, India, N. America and S. Africa are now under irrigation; practically the whole of the habitable part of Egypt has been irrigated from the Nile from time immemorial; and in recent years the Nile's waters have been distributed over large areas of the Sudan. The usual system followed is to dam a river so as to pond up its water, and lead large irrigation canals away from it above the dam on a slightly flatter gradient than the river itself. The main canals feed smaller canals, and these again still smaller canals, which discharge into ditches running through or round the land irrigated. Some of the largest irrigation canals in India carry two or three times as much water as the Thames at London Bridge.

IRVINGITES, a sect, also named the Catholic Apostolic Church, which was founded in 1832 by Edward Irving and Henry Drummond.

ISLAM, the name given by Mohammedans to their religion. (*See* MOHAMMEDANISM.)

ISLANDS, LARGEST. — Greenland, 827,000 sq.m.; New Guinea, 330,000 sq.m.; Borneo, 290,000 sq.m.

IVORY, the material of which elephants' tusks are composed. The finest ivory comes from Africa. As the supply is rapidly diminishing, ivory is becoming steadily more expensive.

JACKAL, a carnivorous animal closely related to the wolf. It is widely distributed through Africa and Asia. Jackals hunt in packs and live largely on carrion.

JACOBINS, a political party which was prominent during the French Revolution, under Robespierre, Marat and Danton, for its bloodthirsty persecution and slaughter of aristocrats. (*See* REIGN OF TERROR.)

JACOBITES, the supporters, in the eighteenth century, of the exiled Stuarts. The abortive risings organized by them in Scotland on behalf of the Old and the Young Pretenders in 1715 and 1745 respectively led to many of them being executed and many being sent to America as slaves.

JADE, a hard mineral, composed of silica, lime and magnesia. Certain green varieties are greatly prized for jewellery and other ornaments.

JAGGERNAUT, or JUGGERNAUT, one of the titles of the Hindu god Vishnu. A huge image of the god is drawn in procession through the streets of Puri, in Orissa, at his annual festival there. Fanatics are said to have sought death under the wheels of the car as an act of devotion.

JANISSARIES, a privileged body of troops created by the Turks in the fourteenth century out of prisoners of war, and kept recruited from Christian boys educated as Moslems. They wielded great political power at times, but were suppressed in 1826 by Mohammed II.

JANUARY, the first month of the year,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

is named after the old Roman god Janus.

JANUS, the ancient Roman god of doors and gates. He is represented with two faces, looking in opposite directions.

JAPANNING, the process of covering metal, wood, etc., with a varnish, usually black in colour. When applied to metal it is hardened by heating in an oven.

JARRAH, an Australian eucalyptus, which yields a hard and durable wood, used for many purposes.

JASMINE, a genus of climbing shrubs, popular for training on houses, walls and trellises. The two species most cultivated are the white-flowered, and the evergreen yellow-flowered.

JASPER, a form of silica, which in some cases is beautifully streaked with red, green, black, brown and other colours. It is used for ornaments and in building.

JAVELIN, a spear used for throwing. Hurling the javelin is one of the "events" in the Olympic Games.

JAZZ, syncopated dance music, developed from negro rhythms.

JELLY-FISH, the general name for a class of marine creatures, distinguished by their umbrella-shaped, jelly-like bodies and long, fringed tentacles. Tropical species attain a diameter of 6 feet or more.

JERBOA, a small rodent found in the deserts of N. Africa and Arabia. It is about 6 inches long, exclusive of its tail, which is longer than the body, and moves in great leaps.

JESUITS, a religious order, also called the Society of Jesus, founded by Ignatius Loyola in 1534. The Jesuits have always been prominent as missionaries in all parts of the world. St. Francis Xavier, one of the earliest members, preached in Japan and China with great success. They accompanied the Spaniards to the New World, and the early French explorers to N. America, where they did and suffered much among the Red Indians. Their great energy has brought them on many occasions into collision with governments, and led to their expulsion or repression.

JEWS, the name given to the Israelites after their return, in the sixth century B.C., from the captivity in Babylonia. After the fall of Jerusalem in A.D. 70 they were settled in Rome, Spain, France and Egypt, whence they gradually spread over Europe, Asia Minor and Asia after the decline of Rome. Though scattered and having no home country, they preserved their religion, customs and social characteristics; and persecution did not prevent their becoming powerful as financiers during the Middle Ages—a position which they have held ever since; or, in later times, of distinguishing themselves in the arts and sciences. They are believed to total about 9,000,000, many having been exterminated in the Second World War. (*See* ZIONISTS.)

JIB, a triangular sail in front of the foremast. A full-rigged ship may carry as many as four jibs. Racing yachts sometimes use a very large "balloon" jib.

JIGGER, or CHIGOE, a tiny flea which burrows under the skin and causes troublesome ulcers. It is found in many parts of the world, and is most prevalent in Central and S. America and Africa.

JIHAD, or JEHAD, a holy war proclaimed against unbelievers by Mohammedans, comparable with the Crusades.

JINGOES, a name given in 1877 to ultra-nationalists who were anxious to fight Russia. Jingoism now signifies an aggressive imperialism. (*See* CHAUVINISM.)

JINRIKSHA, a light two-wheeled passenger vehicle, drawn by a man. Used in Japan, Eastern Asia and S. Africa.

JOHN BULL was first used as the designation of the English or the typical Englishman in Dr. John Arbuthnot's *History of John Bull*, published in 1713.

JOHN O' GROATS HOUSE, a building supposed to have stood at what is almost the most northerly point of Scotland, near Duncansby Head.

JUBILEE, the fiftieth anniversary of an important event, such as the beginning of a reign, or the founding of an institution. Queen Victoria celebrated her Jubilee in 1887, and her Diamond Jubilee in 1897.

JU-JITSU, the Japanese system of self-defence, opposes skill to brute strength. It is based upon a combination of locks and holds which enable a comparatively small pressure to cause great pain or even fracture or dislocation.

JULY, the seventh month of the year, was re-named after Julius Cæsar, born in that month. Previously it had been called Quinctilis, that is, the fifth month of the old Roman year, which began in March.

JUNE, the sixth month of the year, has a name of doubtful origin, ascribed variously to that of the goddess Juno, and to that of the Roman Junius clan or *gens*.

JUPITER, or JOVE, the chief god of the ancient Romans, was the son of Saturn, and regarded as the great protector of Rome. He was worshipped as the deity controlling storms, thunder and rain, and represented with thunderbolts in his hands. Juno was both his wife and his sister. He corresponds to the Zeus of the Greeks.

JUPITER, PLANET, is the largest of the planets, having a diameter nearly 11 times greater, and a weight over 300 times greater, than that of the Earth. It has an enormously thick atmosphere of methane and ammonia. The surface temperature of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Jupiter—which is 483,000,000 miles from the sun, round which it travels once in about 12 of our years—is very low. It has nine satelites, four of which were discovered by Galileo, and the rest in and since 1892.

JURY, a number of persons sworn in at a trial or inquest to hear the evidence and return a verdict based on the evidence given. A jury is instructed by the judge or coroner, but is independent in regard to its verdict. Civil cases may or may not be tried by jury, according to their nature. Criminal cases up to about 1932 used generally to require two juries, a grand jury of 12-23 persons, to decide whether the case shall be proceeded with or not; and a special or petty jury of not fewer than 12 persons, to try the case in court if the grand jury decided that the case must be further dealt with.

JURY MAST, a temporary or makeshift mast erected after a ship has been dismasted by a storm or other agency.

JUTE, a fibre obtained from the stems of plants native to Bengal, and used for weaving into cloth from which sacks and canvas coverings are made. Dundee is the great centre of spinning and weaving jute in Britain.

JUTES, a Germanic tribe inhabiting Jutland (Denmark) and neighbouring territory, who invaded England in the fifth century and settled chiefly in Kent and the Isle of Wight.

JUTLAND, BATTLE OF, the greatest naval engagement of the First World War, fought on May 31, 1916, between the main British and German fleets. The losses in ships and men were heavy on both sides, and the British Fleet failed to annihilate the German. But the battle had the effect of keeping the heavily-armed German ships in port for the rest of the war.

KAABA, the sacred shrine at Mecca wherein is the "black stone" (an aerolite) which, according to tradition, was given to Abraham by the angel Gabriel. It is the Holy of Holies of Mohammedanism.

KAFFIRS, the chief native race of S. Africa, including the Zulus, Mashonas and Basutos.

KALEIDOSCOPE, a scientific toy, invented in the year 1817 by Sir David Brewster. It consists of a metal tube, containing two or three mirrors set at an angle to one another, and having an eyepiece at one end, and a chamber for pieces of coloured glass at the other. When the instrument is revolved, the glass fragments and their many reflections produce numbers of different symmetrical designs.

KALMUCKS, a Mongol race inhabiting S. Russia, Central Asia and Tibet.

KANAKAS, the general name given to South Sea Islanders by whites. Their employment in the Queensland sugar plantations was forbidden by law in 1906.

KANGAROO, an Australian mammal, the hind legs of which are very long and powerful and enable it to make great bounds with ease. The female carries its young in a pouch in the front of the body. Besides the great kangaroo there are two smaller species, called wallabies.

KAOLIN, or CHINA CLAY, is a silicate of aluminium which, when dry, is a very fine white powder. It is produced by the decomposition of felspar in granite. Large deposits of it are worked in Cornwall, for use in the manufacture of porcelain.

KAURI PINE, a pine peculiar to New Zealand, which grows to a great height and yields valuable timber and resin.

KELP is the name given both to the ash obtained by burning seaweed, and to the several varieties of seaweed most commonly used. The ash yields iodine.

KENTISH RAG, a limestone found in large quantities in Kent, and formerly much used for making roads.

KEN WOOD, a property nearly 200 acres in extent, adjoining Hampstead Heath, London, on the north. It was purchased by subscription in 1922, and thrown open to the public in July, 1925.

KESTREL, the commonest of British hawks, also named the windhover, from its habit of hovering over a spot while searching for prey. Its plumage is red, marked with black.

KEW GARDENS, near Richmond, Surrey, have an area of 288 acres. Their full title is the Royal Botanic Gardens, Kew, their origin being botanical gardens laid out in the latter part of the eighteenth century by the mother of George III. In 1840 Queen Victoria gave the Gardens to the nation, and since then they have been greatly added to and laid out in a masterly manner.

KEY INDUSTRIES are those upon which a large number of other industries depend.

KEYS, HOUSE OF, is the lower House, containing 24 representatives, of the Isle of Man Parliament.

KHAKI, the yellowish-brown coloured cloth adopted for the field uniforms of the British Army—first in the South African War—as blending with natural surroundings and rendering the wearer inconspicuous.

KHEDIVE, the former title of the hereditary ruler of Egypt. Under the Constitution given Egypt in 1923, that country is now ruled by a king, Farouk I, in consultation with a parliament.

KINDERGARTEN, a system of educating very young children introduced by

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Friedrich Wilhelm Froebel (1782-1852), a German, in 1837. It is based upon the use of very simple apparatus, such as balls of coloured wools, models of geometrical figures, divided cubes, and games which arouse the pupils' interest, and give instruction, as it were, unawares.

KINEMATICS, that branch of applied mathematics which deals with the velocity and increase in velocity of bodies in motion independently of mass or outside forces.

KINGFISHER, the most brightly-coloured of all British birds. Its back is a bright blue, its head bluish-green, its throat white and its underside orange-red. It has a long beak and a short tail. From a branch overhanging a stream it swoops down upon small fish. Its nest is a collection of fish bones in a deep burrow in a river bank, in which it lays white eggs.

KING'S PRIZE, the blue ribbon of British rifle shooting, is competed for annually at Bisley. It is open to all British subjects who are past and present members of His Majesty's Forces, and is shot for in three stages. The winner gains the King's Prize of £250, and the Gold Medal and Gold Badge of the National Rifle Association.

KING'S SPEECH, the speech delivered by the Sovereign in person, or by someone commissioned to take his place, at the opening of a new Parliament. It reviews past policy and outlines important matters that will be the subject of legislation in the forthcoming session. Addresses in reply are read in both Houses of Parliament.

KITCHEN MIDDENS, large deposits of refuse left by prehistoric races in many parts of the world. They consist chiefly of the shells of shellfish and bones. Some of them contain many hundred tons of animal remains.

KNIGHTHOOD, a dignity conferred by the Sovereign, ostensibly for distinguished service to the country. It carries the title of "Sir" before the Christian name, but is not hereditary. Originally it was a military title only.

KNIGHTS HOSPITALLERS, or KNIGHTS OF ST. JOHN OF JERUSALEM, a religious order founded in the eleventh century to assist pilgrims visiting the Holy Sepulchre. They afterwards became a powerful military-religious organization, with headquarters successively at Cyprus, Rhodes and Malta, which opposed the Turks until its suppression in the eighteenth century.

KNOT, in the nautical sense, is a speed of one sea-mile (about 1⅛ statute mile) per hour.

KORAN, the sacred book of Islam, was not written by Mohammed himself, but after his death by his secretary. It consists of 114 chapters, and sets out the things revealed by God to the prophet. Among Mohammedans it is the supreme authority on all matters of doctrine. (*See* MOHAMMEDANISM.)

KREMLIN, THE, the fortress of Moscow, begun in the fifteenth century and added to at various periods. It includes palaces, cathedrals and churches, intermingled with military buildings.

KRYPTON, a gaseous element existing in the atmosphere in minute quantities, discovered by Sir W. Ramsay in 1898. Like argon, it is chemically inactive.

KU-KLUX-KLAN, a secret society founded in the Southern States of the United States after the Civil War to control the recently freed negroes. Members moved about at night, clad in white outer garments including a hood with eye-holes.

LABOURERS, STATUTES OF, laws passed in 1349 and 1350 after the Black Death, when there was a great shortage of labour, to maintain the prices and wages current before the plague.

LABOUR PARTY, a parliamentary party which, in Britain, has been officially in existence since 1906 to represent trade unionists and Socialists who aim at bringing about, by legislation, fundamental changes in the government and economy of the country. It has formed governments in 1924, 1929-1931, and 1945.

LABYRINTH, a maze of winding passages. The word is most commonly used of that which, according to ancient Greek legend, was constructed by Dædalus for Minos, King of Crete, to confine the Minotaur.

LACE is a fabric of linen or cotton in which both ground and pattern are formed at the same time, either by hand or by machinery. Hand-made laces are of two kinds; pillow laces, created by interweaving the threads on a number of bobbins round pins stuck into a cushion; and needle point laces, produced with a needle. Various distinctive types have their respective names—Mechlin, Valenciennes, Honiton, etc. Since about 1810 laces, imitating hand-made laces very accurately, have been woven by ingenious machines.

LACQUER, a hard varnish used for covering wood, metal and other substances. Japanese lacquer for wood is black or coloured. The transparent lacquer used for protecting polished brass and copper surfaces is shellac dissolved in alcohol and sometimes tinted with turmeric or dragon's blood.

LACTOMETER, a graduated float for measuring the richness of milk.

LADYBIRDS are flying beetles, with bodies rounded above when the wings are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

closed. Of the many British species that with seven black spots on its red wing-covers is the best known. It assists the gardener by killing aphides.

LAGOON, a body of water alongside the sea or a river, from which it is separated by banks of sand or earth. In many cases there is a natural entrance to a lagoon from the adjacent water.

LAKE DWELLINGS, houses built by prehistoric races on piles near the edge of a lake. They were approached by narrow gangways, which could easily be defended. Remains of them have been found in Ireland, Somersetshire and elsewhere.

LAMA, a Mongolian Buddhist priest. Tibet is the chief centre of the Lamas, who are there congregated in great monasteries. (*See* DALAI LAMA.)

LAMMAS DAY, August 1, is a quarter day in Scotland. The word means "loaf mass," for on that day a loaf used to be offered in church as first-fruits.

LAMMERGEIER, a large bird of prey found in S. Europe, Africa and Asia. Though in appearance it resembles the eagles, having its neck feathered, it is vulture-like in feeding almost entirely on carrion.

LAMPBLACK, very fine soot deposited by a smoky flame, used in the manufacture of pigments and printing ink.

LAMPREY, an eel-like creature which lives in water, and is a fish. It has a sucker mouth with which it anchors itself to stones.

LAMPS. — The earliest lamps burned animal or vegetable oil, supplied through a wick to a flame, which was naked. In 1784 Aimé Argaud invented the burner with circular wick and central draught, and surrounded the flame with a glass "chimney," which greatly improved combustion and increased the brilliancy of the flame. Paraffin lamps came into general use after the discovery of petroleum in America. Among the more recent forms of portable lamps are the acetylene lamp, the self-contained electric lamp, and the paraffin vapour lamp which is fitted with an incandescent mantle.

LAND, in the geographical sense, signifies all areas of the outside of the globe which are not covered by water. They total some 60,000,000 sq. miles, of which the larger part is in the northern hemisphere. In the east of England land is constantly being eaten away by the sea, while in the south it is added to by deposited sand, shingle, etc. Upheavals and settlements of the earth's crust cause increase of land area in some parts of the world and decrease in others, though the process may be so slow as to be imperceptible. At one time—millions of years ago, perhaps—Britain was connected with Europe by land now sunk under the North Sea and English Channel.

LAND LEAGUE, THE, a movement set on foot in Ireland in 1879, ostensibly to reduce rents. After much victimisation of those who did not support it, it was suppressed by Act of Parliament two years later.

LANDRAIL, or CORNCRAKE, a bird of about the size of a partridge, which lives among standing grass and corn, and is seldom seen; its monotonous "crake" is frequently heard during the summer nights.

LAOCOON, the Trojan priest who tried to dissuade the Trojans from admitting the Wooden Horse inside their city. As punishment, Poseidon sent two serpents which killed him. (*See* WOODEN HORSE.)

LAPIS LAZULI, a stone of a deep blue colour, used for jewellery and ornaments.

LAPWING, or PEEWIT, is the common or green plover, which haunts marshes, waste lands and downs. It has handsome black and white plumage and a long upstanding crest. Its slow, flapping flight and its cry—which gives it the second name mentioned—are characteristic.

LARCH, a cone-bearing tree, which sheds its leaves. It grows to a height of 100 feet and yields a hard, tough timber.

LARD is the fat of pigs, melted and strained. The best is that from round the kidneys.

LARES, the spirits of departed ancestors, worshipped by ancient Romans. They were divided into two main groups, household Lares, protectors of the house or family, and public Lares, the guardians of the city or community.

LARKSPUR, or DELPHINIUM, a tall annual or perennial, which bears blue (most commonly), red or yellow flowers; a favourite for herbaceous borders.

LASCAR, a sailor of Indian or East Indian birth, serving on a British ship.

LATENT HEAT, the heat which is required to change a substance from the solid to the liquid, or from the liquid to the gaseous state, without raising its temperature. When water has reached boiling point it requires additional heat to convert it into steam, though the steam at this stage is no hotter than the water. This heat becomes latent, or hidden, in the steam, and is given out again when the steam condenses back into water.

LATERAN, an old palace at Rome which till the fourteenth century was the residence of the Pope. Close to it is St. John Lateran, the cathedral church of the Pope at Rome, and regarded as the first of all Roman Catholic churches.

LATITUDE, distance north or south of the equator, measured in degrees, minutes

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and seconds. The equator itself, being the starting, or zero point, is latitude 0°.

LATTER DAY SAINTS.—*See* MORMONS.

LAUGHING GAS is nitrous oxide. When inhaled it produces temporary unconsciousness, and the mild intoxication which gives it its name. Used by dentists for the extraction of teeth.

LAVA, molten rock expelled by a volcano in eruption. It is the chief agent in forming the cone round the orifice of the volcano. The surface hardens quickly, but the lava below may remain hot for years.

LEAD, a bluish-white metal, one of the elements, distinguished by its weight, softness and low melting point. It is obtained mainly from two ores, lead sulphide or galena, and lead carbonate or cerussite. Being practically unaffected by air and water, it is used, in sheet form, for covering roofs; as a protection for underground electric cables, and for water pipes. Mixed with tin and other metals, it makes solder and soft alloys. White carbonate of lead, called "white lead," and the red oxide, "red lead," are used in paints, and the latter in the manufacture of glass.

LEAGUE OF NATIONS, THE, came into existence with the signing of the Treaty of Peace with Germany in January, 1920. Its main object was to prevent the recurrence of such disasters as the First World War, by substituting arbitration as far as possible for violence in the case of disputes between nations. The signatories to the Covenant of the League, which eventually included 57 nations, bound themselves to submit any quarrel to the consideration of the Council of the League. Besides being an agency for promoting disarmament among the nations, the League was an international organization for dealing with matters which affect humanity as a whole—labour conditions, hygiene, control of the drug traffic, agriculture, etc. The Assembly of the League met annually at Geneva, where each signatory state was represented by up to three members, but had one vote. Disbanded in April, 1946.

LEANDER, in Greek legend, a youth who swam the Hellespont nightly to visit Hero, a priestess of Aphrodite. One night the guiding light lit for him was extinguished, and he lost his way and was drowned.

LEASEHOLD, a tenancy of property limited to a certain number of years. The ordinary building lease is for a period of 99 years. The tenant pays a yearly charge, called ground rent, to the owner of the land, who, at the expiry of the lease, becomes owner of whatever has been built on it.

LEASE-LEND ACT, THE.—As the Foreign Aid Bill, this measure was passed by the United States House of Representatives in 1941 by 260 votes to 165, and by the Senate by 317 votes to 71. President Roosevelt was empowered to help any country whose defence he regarded as vital to the United States. The first allocation was for armaments to the value of £325,000,000, but food was also included. When the United States entered the war the scope of the arrangement was extended by means of reciprocal aid on the part of Britain, which provided transportation, accommodation and other facilities to American troops in the British Isles and elsewhere.

LEATHER.—The skins of animals, preserved, softened, and otherwise prepared for use by the processes of tanning, curing and dressing, after the hair has been removed. In the case of "patent" leathers, the leather is coated on one side with a varnish which gives it a highly polished, and usually black, surface. The proverb that there is "nothing like leather" is true, in so far as that, for certain purposes, which demand great strength, toughness, flexibility and durability combined, no substitute for leather has yet been discovered.

LEGAL TENDER, signifies the means by which a debt can legally be discharged. Gold and Bank of England notes are legal tender to any amount, silver up to £2 and bronze coin up to one shilling.

LEGION, the divisional unit of a Roman army, corresponding to the modern regiment. It varied at different periods between 3,000 and 6,000 men. It was subdivided into ten cohorts.

LEGION OF HONOUR, a French order of merit, instituted by Napoleon I in 1802, and conferred on members of the military forces and civilians for distinguished services to their country. It has five grades, ranging from Knights Grand Cross down to Chevaliers.

LEMMING, a small burrowing rodent, related to the vole. Norwegian lemmings migrate periodically, doing much damage to any crops encountered, and on reaching the sea, plunge into it and are drowned in vast numbers.

LEMON, the fruit of a tree native to India, but now cultivated in many parts of the world, which belongs to the same genus as the orange, grapefruit and lime.

LEMUR, a mammal related to the monkeys, but distinguished from them by its bushy tail. Found in Africa, India and the Malay Archipelago. It moves about at night, and feeds on fruit, buds and insects.

LENSES are glass discs with one or both faces curved. If thicker at the middle than at the edges they magnify; while if

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thinner at the centre they reduce the apparent size of an object. According to the shape they are classified as: double convex (bulging), double concave (hollow), concavo-convex, plano- (flat) convex, and plano-concave.

LEOPARD, a large carnivorous animal of the cat family, distinguished by bold dark spots in its fur. It is found in S. Asia and Africa.

LEPANTO, BATTLE OF, was fought on October 7, 1571, between the navies of Austria, Italy and Spain, under Don John of Austria, and the Turkish corsair fleet, commanded by Ali Pasha. The latter was completely defeated with the loss of 200 ships and 30,000 men.

LEPIDOPTERA, all those insects which have their wings and bodies covered with scales; butterflies and moths.

LETTRES DE CACHET, sealed letters sent by French kings to officials, authorizing them to arrest persons named therein. They were abolished at the Revolution.

LEVEE, a reception held by the Sovereign or his representative, at which men only are present and presented.

LEVELLERS, a republican group in the Cromwellian party during the Civil Wars, which aimed at abolishing all distinctions of rank. They mutinied against Cromwell and were suppressed by force.

LEYDEN JAR, a form of electrical condenser, consisting of a glass jar covered part way up with tinfoil on the outside and inside. A rod passing through an insulated stopper, and having a chain at the end, enables the jar to be charged or discharged.

LIBEL is any printed or written matter, or drawing, which damages a person's public or private reputation. The publisher of a libel may be proceeded against and punished, even if the libel is true, unless he can show that his action was in the public interest.

LIBERAL PARTY, in Parliament, is the successor of the old Whig Party. The change of name was made in 1832. It has on principle favoured extensions of the franchise and free trade.

LIBERAL UNIONISTS was the name given to Liberals who broke away from their party in 1886 on the subject of Home Rule, being strongly in favour of maintaining the union between Great Britain and Ireland, and combined with the Conservatives to form the Unionist Party.

LICENCES fall into two main classes: (1) those giving permission to manufacture or buy and sell, and administered by the Board of Customs and Excise; (2) those which entitle a person to have or use something, and are called local taxation licences. Examples of the first class are: licences for making or retailing alcoholic liquors, tobacco and sweets; of the second class, dog, gun and vehicle licences.

LIFE ANNUITY, a yearly sum assured till death by the payment of a lump sum. The ratio of the purchase-money to the annuity decreases with age, and is rather smaller for males than for females.

LIFEBOAT, a boat specially designed for saving life at sea. It is unsinkable, and frees itself automatically of any water that comes aboard. Its lines make it extremely stable, and in some cases the boat is so constructed as to right itself if it is upset. Most of the recently launched boats are equipped with powerful motors, which render them independent of sails and oars; and some are equipped with wireless, line-throwing apparatus, and nets into which those being saved may safely jump. The first lifeboat was that of Henry Greathead, built in 1789. By 1824, when the Royal National Lifeboat Institution was founded, there were 40 boats in use. The first steam lifeboat was put into service in 1890; the first motor lifeboat in 1904. The Royal National Lifeboat Institution, supported by voluntary contributions, controls the lifeboat service of Britain.

LIGHT may be defined as etheric radiations of those frequencies to which the eye is sensitive. Violet light is due to radiations numbering 750,000,000,000,000 per second; red light is caused by a frequency of 400,000,000,000,000 per second. Between them come in order indigo, blue, green, yellow and orange light, of intermediate frequencies. White light is a mixture of all the colours. Light of any colour travels at a speed of 186,000 miles per second.

LIGHTHOUSES, to assist navigation by warning ships off dangerous rocks or give them bearings, have been in use for many centuries. The lighthouse standing on a solitary rock, exposed to the full violence of the waves, is in all cases a massive circular column of stones, keyed together, depending for its stability on sheer weight. In shallow water a lighthouse may be supported on piles. Many land lighthouses now employ electric lighting, while isolated lighthouses make use of the incandescent mantle heated by gasified paraffin oil, or of acetylene gas. Lighting apparatus includes lenses, prisms and reflectors for concentrating the light into a horizontal beam; and in most cases mechanism which revolves the apparatus, causing beams to be seen at intervals peculiar to the individual lighthouse. All British lighthouses are under the control of Trinity House. (*See* TRINITY HOUSE.)

LIGHTNING, a very violent electrical discharge between clouds, or between a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cloud and the earth. The time occupied by a flash may be less than a millionth of a second, though the impression left on the eye lasts at least 1/10th second.

LIMELIGHT, the intense light from a slowly revolving bar of calcium oxide, on to which a jet of oxygen mixed with hydrogen or coal-gas is directed. It is used chiefly for magic lanterns.

LIMESTONE, a species of rock consisting of carbonate of calcium, usually mixed with small quantities of silica, carbon and organic matter. Limestone is burnt in kilns to produce quicklime. Being very soluble in water containing carbon dioxide, limestone is hollowed out into large caves by streams running through it, as at Cheddar, Buxton and elsewhere.

LINEN, a textile fabric woven out of flax threads. It has the advantages over cotton cloth of being more durable and taking a higher polish when ironed. Used chiefly for tablecloths, napkins, wearing apparel, handkerchiefs and sheets. The chief centre of linen manufacture in the British Isles is Belfast.

LINOLEUM, a floor covering made by attaching to a canvas backing a layer of mixed cork dust, oxydized linseed oil, resins and other materials, including colouring matter. A pattern may be printed on the surface, or created by piecing together a number of parts cut from mixtures of different colours. In the second case the pattern goes right through, and cannot be obliterated by wear.

LINSEED, the seed of the flax plant. When crushed it yields linseed oil, an important constituent of paints and linoleums. The spent husks make valuable cattle food.

LION, the "King of Beasts," and the most imposing of the cat family of carnivorous animals, is found only in Africa and, in smaller numbers, in Persia and N.W. India. The male has a handsome mane, which is absent in the female. It seldom attacks man, unless provoked, and in Africa feeds chiefly on zebras and antelopes.

LION AND UNICORN, the "supporters" of the Royal Arms of Great Britain, date from the Union of England and Scotland in 1603, when the Scottish unicorn replaced the former dragon of Wales.

LIQUEURS, concentrated alcoholic beverages, flavoured with extracts made from herbs, fruits or seeds.

LIQUIDS are substances which fill by their own weight a space equal to their own volume in any vessel into which they are put. When at rest they have a level surface except where contact occurs with the vessel. Sufficient cold converts them into solids; heat, into gases.

LIQUID FIRE is a modern version of an ancient device. It was used in the Sudan in 1930, when tins of petrol ignited by incendiary bombs were dropped from aircraft on water to suggest to the natives that if they caused trouble it was possible to set even the Nile on fire. Liquid fire was employed by the Assyrians, whose short-lived empire, sustained by war, disappeared over 600 years B.C. The Greeks may have rediscovered the secret. They used ingredients that came to be known as Greek fire. It is believed that sulphur, pitch and naphtha were included. Poured through a tube, it ignited on exposure to the air, and nothing could extinguish it but vinegar and sand. The flame made a deep roar, dense smoke and an appalling stench. In modern warfare mechanized carrier flame-throwers are used as well as a portable "lifebuoy" type carried by infantry. In the former, known as the Wasp, the oil and petrol that constitute the mixture are carried in tanks and forced under high pressure out of a brass nozzle, which has an igniter that fires the spray. The flame, a yard or so in diameter, can be thrown 100 yards ahead. It proved invaluable in wiping out the German "pill-box" strongholds. Liquid fire bombs dropped from aeroplanes were used to clear an enemy pocket on the Gironde estuary in April, 1945, over 400,000 gallons being used in the attack.

LIQUORICE is the underground stem of a plant grown in S. Europe. When macerated in water it yields the extract used in sweets and for medicinal purposes.

LITHOGRAPHY, the art of printing designs in one or several colours, from stones, or, in recent processes, from aluminium plates.

LITRE, the standard of capacity or volume in the metric system. It is equivalent to a cubic decimetre, and equals 1.76 English pints.

LIVERY COMPANIES OF LONDON are the descendants of the Guilds of the Middle Ages (*see* GUILDS). They now number 78. Each has its hall, and its distinctive badge or coat of arms. The Mercers are the senior Company.

LLAMA, a S. American mammal, related to the camel, which is domesticated as a beast of burden and yields a valuable, long-fibred wool.

LLOYD'S, the marine insurance institution, founded by Edward Lloyd in the seventeenth century. Its headquarters are now in Leadenhall Street, London.

LOADSTONE, or LODESTONE, is magnetic iron ore, which was probably used in early mariner's compasses.

LOBSTER, a long-tailed crustacean, which has very large claws and is esteemed

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as a delicacy. Lobsters are caught in traps, easy to enter, but difficult to find a way out of. They frequent rocky coasts.

LOCK-OUT, the closing of a factory, or factories, by the owners during a labour dispute. It is the antithesis of the strike.

LOCUST, a large insect of the grasshopper family, which in Africa and Asia does great damage to agricultural crops. The young insects, called "hoppers," are particularly destructive. Coping with these insects is now the subject of an international commission.

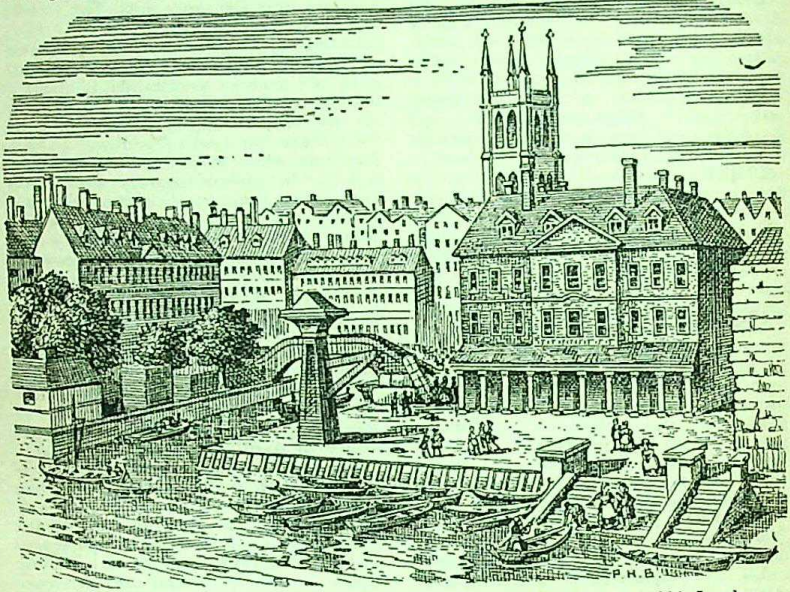
LOG, in the nautical sense, is an instrument towed by a ship to show the distance —from which the speed can be reckoned— which it travels in a given time. The mechanical log consists of a small propeller revolving in the wake of the vessel.

LOGIC, the scientific study of reasoning, or the science of exact reasoning, originated with the Greek philosopher Aristotle (384-322 B.C.). The general aim of it is to establish methods by which the soundness of an argument can be judged.

LOGISTICS, a military term denoting the supply, equipping and movement of troops everywhere. Logistics includes food, clothing, equipment, ammunition, medical service, transportation, records and postal service.

LOGWOOD, a Central American tree from the heart-wood of which a red dye of the same name is extracted.

LOLLARDS, a religious party in England which, during the fourteenth and fifteenth centuries, opposed the doctrines, ritual and demands of the Roman Church. Though commonly regarded as the followers of John Wyclif (c. 1320-1384), they actually somewhat estranged him and his most influential supporters by their extremism.



Fleet Ditch, as it appeared before being enclosed—a typical piece of Old London

LONDON, the capital of England, the chief city in the British Empire, and the greatest city in the world, originated in a British village, Llyndun, or Llyndain, the name of which meant "The Fort on the Pool," on the north bank of the Thames. When the Romans came they named it Londinium, surrounded it with a wall, which can still be traced and seen in places, and made it a great city, from which roads radiated in several directions. It did not, however, become the metropolis of England till the Saxon period. The Normans built the Tower of London on the site of an old Roman fort, to overcome and control the city, and William I gave the city a charter confirming certain privileges, some of which have endured till the present time.

Suburbs sprang up outside the walls in the seventeenth century and these have

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

extended ever since. At the present day the word "London" has several different significations. The City of London, with an area of about one square mile, and a great commercial centre of England, is the original London, as regards its limits, and has its own local government under the Lord Mayor. Outside the City of London is the County of London, or Inner London, established by Act of Parliament in 1888, covering 117 square miles, and including 28 metropolitan boroughs, which, though to a certain extent independent, constitute a county which is administered as a whole by the London County Council. Inner London has a population of about 4,500,000. What is called Greater London has an area of about 700 square miles, and a population of over 8,000,000. This includes suburbs in Middlesex, Essex, Surrey and Kent, outside the County area.

LONDON MUSEUM is a collection of objects connected with the history of the city, now housed in Lancaster House, St. James's, London, to which it was removed from Kensington Palace in 1914.

LONGITUDE is distance east or west of a meridian adopted as zero. Most countries have adopted the meridian passing through Greenwich as that from which longitude is reckoned.

LORD, a title of address which belongs by right to all peers and to archbishops and bishops having seats in the House of Lords, and is attached as an honorary title to certain high offices, such as those of Lord Chancellor and Lord Chamberlain.

LORD CHANCELLOR. — *See* CHANCELLOR, LORD.

LORD'S CRICKET GROUND, in St. John's Wood, London, has been the headquarters of the Marylebone Cricket Club (M.C.C.), the ruling body of cricket, since 1814.

LORDS, HOUSE OF. — *See* PARLIAMENT.

LOUDSPEAKER, a loudspeaking telephone, which enables sounds transformed from electric vibrations to be heard at a distance.

LOUVRE, THE, Paris, once a royal palace, and now the greatest of all art museums. It houses priceless collections of pictures, statues, gems and antiques.

LOW SUNDAY, the Sunday next after Easter Day.

LUCERNE, or ALFALFA, a plant with a pretty purple flower, grown as fodder. It is very deep-rooted, and able to endure drought better than hay.

LUNAR MONTH.—*See* MONTH.

LUTHERANS, members of the Protestant body which adheres most closely to the original principles of Martin Luther, and lays special emphasis on the doctrine of grace by faith. They are most numerous in Germany—the native land of Luther, where they form the chief church—Sweden, Norway, Denmark and the United States.

LYCH-GATE, a gate at the entrance to a churchyard, usually covered with a gabled roof. The words mean "corpse gate." At one time the first part of the burial service was held at the gate, under the shelter of the roof.

LYNCH-LAW means the administration of justice by an excited mob, especially in the United States, where a farmer named Lynch made himself notorious in the eighteenth century by his arbitrary punishment of people who offended him.

LYRE BIRD, an Australian species, the males of which have long-curved tail-feathers shaped like the sides of a lyre.

MACAW, the general name of various species of large and very gaily-coloured parrots, native to S. America.

MACCABEES, members of a famous Jewish family who in the second century B.C. headed a long and eventually successful revolt of the Jews against Antiochus Epiphanes, King of Syria.

MACE, a spice made from the inner husk of the nutmeg.

MACHINE GUN is a gun which fires (usually) ordinary rifle ammunition at a very rapid rate as long as the trigger is held back and the supply of cartridges in a magazine or on a belt lasts. An empty case is ejected and replaced by a loaded cartridge by automatic apparatus operated by the recoil or internal pressure of the gun.

MACKEREL, a valuable food fish which is caught in large numbers by lines and drift nets round the British coasts. It is distinguished by its steely-blue colour, striped with dark markings.

MADAME TUSSAUD'S, the waxwork exhibition of famous and notorious persons in Marylebone Road, London, was founded in 1804, and reopened, after having been damaged by fire, in 1939.

MADRIGAL, a part song for three or more voices, in which each part becomes prominent in turn. It attained its fullest development in Italy and England.

MAFIA, a secret and terrorist society in Sicily, which for considerably more than a century levied blackmail on the inhabitants of the island. Its activities were suppressed under the Fascist régime by Signor Mussolini.

MAGI, the priests or seers of the ancient Persians and Chaldæans. The "Wise men from the East" who came to offer gold, frankincense and myrrh to the infant Christ, as related in St. Matthew's Gospel.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are traditionally represented as being Magi.

MAGIC LANTERN, an optical instrument for projecting a greatly enlarged image of a photographic or other subject, on a transparent glass "slide," on to a white screen. The light from the illuminant is collected by large lenses, called condensers, and concentrated on to the slide. This is placed at one focus of the projecting lenses which have their other focus on the screen.

MAGINOT LINE, an elaborate but incomplete defence system of forts and blockhouses in France running from the frontier near Basle to the border of Luxemburg, with a secondary line to the coast. Built at a cost of £600,000,000, it was regarded as impregnable. Some 700,000 French troops garrisoned the Maginot Line, which proved to be one of the biggest failures in history. On the fall of France in 1940, the Germans removed many of the guns for service elsewhere. Germany's answer to the Maginot Line was the Siegfried Line, or Western Wall, a fortified strip of territory with an air defence zone which ran parallel part of the way but extended as far north as the neighbourhood of Essen.

MAGISTRATE, a person officially appointed to administer the law. Those magistrates who are known as justices of the peace are not paid for their services; but stipendiary, police and certain other magistrates receive payment.

MAGNA CHARTA, the Great Charter, regarded as the foundation on which the liberties of the citizen are based, was signed by King John at Runnymede, on the Thames, in June, 1215, by order of the barons. Its chief articles were: that no man should be denied justice; that no freeman should be imprisoned or exiled except after judgment by his peers; and that the king should not be able to exact money from his lieges except by consent of the Great Council (the Parliament of the time).

MAGNESIA, oxide or carbonate of magnesium, used in medicine.

MAGNESIUM, a soft white metal, one of the elements, which burns with a dazzling white light and is used for taking "flashlight" photographs. It is alloyed with aluminium to form magnalium.

MAGNETISM is a quality which gives a body polarity, that is, the properties of turning into a north and south line if left perfectly free to adjust its direction, and of attracting steel, iron and, to a much more limited extent, nickel. A body possessing magnetism is called a magnet. The iron ore named magnetite (*see* LOADSTONE) is naturally magnetic. The earth is a huge magnet. A bar of steel may be converted into a permanent magnet by stroking it with a bar already magnetized, or by surrounding it with a coil and passing a current through the coil. Soft iron can be temporarily magnetized in the second way.

MAGNIFICAT, the canticle in the Order for Evening Prayer of the Prayer Book, sung after the first lesson. It is the hymn of praise of the Virgin Mary (Luke i, 46-55), and gets its name from the opening word of the Latin version, meaning "doth magnify."

MAGYARS, a race of probably Mongolian origin, which invaded the Roman Empire in the ninth century and settled in what is now Hungary. They speak a language of their own, very different from that of neighbouring states, and form the greater part of the population of the Republic of Hungary, as constituted in 1946.

MAHOGANY, the reddish-brown timber of trees native to Central America, the West Indies and W. Africa, and used chiefly for furniture and house fittings. It takes a high polish. The best, which comes from Cuba, is called Spanish mahogany.

MAIZE, or INDIAN CORN, is a cereal grown very extensively in America, Africa and other countries for the grain, which is there a very important article of diet. The yield of grain per acre is much greater than that of wheat or barley. In England it is used extensively as chicken food. The Americans call it simply "corn"; in Africa it is named "mealies."

MALT, grain (usually barley) which has been steeped in water and heated until it germinates. It is used in the manufacture of beer and whisky, and its nutritive properties make it valuable also as a constituent of nourishing medicinal preparations.

MAMMALIA, or MAMMALS, are all those animals which reproduce their young from the body in the form which they will finally assume, and suckle them with milk. They are the highest class of the vertebrates or backboned animals, and include man. All have four limbs and, with few exceptions, are clothed with hair.

MAMMOTH, a prehistoric elephant living in cold regions and clad in a thick covering of hair. Many skeletons, and even complete specimens, have been exhumed.

MANATEE, a marine mammal, which inhabits the river estuaries of S. America and W. Africa. It is closely related to the Asiatic dugong or sea-cow, and is hunted for its hide and oil.

MANDARIN, a Chinese military or civil official. There are nine grades, distinguished by the button on the cap worn.

MANDATED TERRITORIES are those possessions of the conquered powers, which,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

after the First World War, were entrusted by the League of Nations to one or other of the Allied Powers to be administered in the interest of their inhabitants.

MANGANESE, a metallic element, found chiefly in combination with oxygen. In its pure state it is used in the manufacture of ordinary and special steels, and in alloys of metals other than iron. In combination with other elements it forms manganates and permanganates, the best-known of which is permanganate of potassium, used as a disinfectant.

MANKIND, RACES OF.—At one time it was the fashion to divide humanity into three races: the more or less white Caucasians, the yellow-skinned Mongolians, and the black-skinned Negroes. Now, however, in the light of modern research, the sub-division is more extended to differentiate the Semitic races of N. Africa and brown races of Oceania. Calculations, which cannot be regarded as exact, would seem to show that the Caucasian race of Europe, America and the E. and S. of Asia predominates in number, closely followed by the Mongolian (including the Red Indians of N. America), with the Negroes far behind, and the Semitic and brown races in a still smaller minority.

MANSION HOUSE, THE, in the heart of the City of London, is the official residence of the Lord Mayor of London during his year of office. It was built in 1739.

MANURES are substances which increase the fertility of soil by supplying elements needed by plants for their growth —nitrogen, phosphorus, lime, etc. They may be sub-divided into natural manures, such as animal manures (including farmyard manure and guano); and artificial manures, such as sulphate of ammonia (rich in nitrogen) and basic slag (rich in phosphorus).

MAORIS, the aboriginal inhabitants of New Zealand, related to the Polynesians. They have a dark complexion and frizzled or straight brown hair. They now number about 85,000 (including half-castes), and are represented in the Dominion Parliament.

MAPLE, a tree or shrub with a five-lobed leaf, related to the sycamore. The foliage of the Canadian maple (the leaf of which is the national emblem) turns crimson in autumn, and one species of it when tapped yields a syrup which is boiled down into sugar. The wood is used for furniture.

MARATHON RACE, the longest running event of the Olympic Games, is over a course of 26 miles, 385 yards—equal in length to the traditional distance from Marathon (Greece) to Athens.

MARBLE is crystalline limestone, either pure white, or coloured or streaked by other minerals, which make them black, red, pink, green or yellow. The best statuary marble comes from Carrara, in Italy.

MARCH, the third month of the year, is named after the Roman god Mars. Until 1752 the legal or civil year began on March 25 (Lady Day), though the historical year commenced on January 1. In 1752 they were brought into line, both beginning on January 1.

MARGARINE, a substitute for butter, made from animal fat, vegetable oils and milk.

MARINES, ROYAL, a military force, administered by the Admiralty, which serves aboard ship and in dockyards and certain forts. It was raised in 1664, disbanded in 1689, and reformed in 1690.

MARMOSET, a family of very small American monkeys which live entirely in trees. Some species have long hairy fringes on their ears.

MAROONS was the name given to runaway slaves in the W. Indies, who took refuge in the mountains and held out for a long time against the authorities. Those of Haiti succeeded in forming negro republics. Their present-day descendants are also spoken of as maroons.

MARQUESS, or MARQUIS, the second order in the English peerage, ranking below duke and above earl.

MARS, the Roman god of war and agriculture. (*See* ARES, MARCH.)

MARS, PLANET, is the nearest to the earth of the planets revolving outside it. It has a diameter little more than half that of the earth, and travels once round the sun in 687 of our days. There has been much speculation, based mainly on alleged "canal"-like markings on the surface of the planet, as to whether Mars is inhabited. The case in favour seems to be a weak one, as the temperature on Mars must be very low, owing to the thinness of the planet's atmosphere.

"MARSEILLAISE," the national song of France, was written and composed by Claude Rouget de Lisle, a young engineer, in 1792. It got its name from the fact that it was sung by volunteers from Marseilles as they entered Paris to storm the Tuileries.

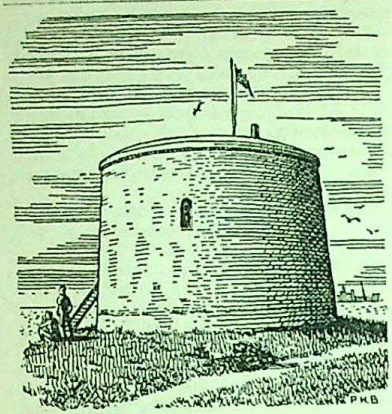
MARTELLO TOWERS, circular stone forts built on the south and east coasts of England during the Napoleonic wars, to repel any landings that might be attempted. Large guns were mounted on their flat tops.

MARTIAL LAW is the substitution of military for civil law by an invading army or during serious riots or political disturbances.

MARTIN, a bird of the swallow family. The common martin can be distinguished

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Martello Tower, one of many built on Britain's south coast when Napoleon threatened invasion

from the swallow by its much shorter tail and by the white patch of feathers on its rump. One species, the sand martin, makes deep nesting-holes in the faces of sandy cliffs.

MASON AND DIXON'S LINE is the name of the boundary marked between Pennsylvania and Maryland in 1767 by two engineers whose names were given to it. Before the Civil War it was regarded as dividing the Southern slave-owning States from the free Northern States.

MASTIFF, a very old and large species of British dog, standing about 30 inches at the shoulder. Short-haired, large-headed, intelligent, and usually gentle and docile.

MATCHES, for kindling a flame, were invented in 1806 and replaced the clumsy tinder-box soon afterwards. The earliest form was ignited by contact with a pad soaked in sulphuric acid. The friction match, ignited by rubbing on a rough surface, appeared about 1850, and the "safety" match, which lights only if rubbed on a specially-coated surface, in 1855. Modern matches are made by ingenious machinery which cuts the wood into splints, dips the splints into heading composition, and packs them into boxes.

MATHEMATICS, the science which deals with numbers, quantities and magnitudes, and their properties and relationships. It is divided into two great branches: (1) pure mathematics, which regards numbers, etc., apart from anything else, and covers arithmetic, algebra, geometry, trigonometry and calculus; (2) applied mathematics, in which they are associated with physics, as in optics, mechanics, dynamics, astronomy, etc.

MAUNDY THURSDAY, the day before Good Friday. On that day royal alms, called Maundy Money, is distributed among poor people at Westminster Abbey.

MAY, the fifth month of the year, is named after Maia, the old Latin goddess of growth and increase.

MAYAS, an ancient people who flourished in America some 2,000 years ago, and by about A.D. 300 had created cities in Central America with buildings ornamented with carvings of intricate design. Their cultural greatness had departed when the Spaniards arrived in the sixteenth century.

MAY DAY, the first day of May, has long been associated with nature-worship and festivity. In England a May Queen was elected in every village, and people danced round a maypole, set up on the green. The old customs have declined, and now the observance of May Day is limited mainly to labour demonstrations.

"MAYFLOWER," THE, a ship which sailed from England on September 6, 1620, having aboard 102 men and women — "The Pilgrim Fathers" — and reached Plymouth, in Massachusetts, on December 21 of that year. (*See* PILGRIM FATHERS.)

MAYNOOTH COLLEGE, Kildare, Ireland, was founded in 1795 as the great training centre for Irish students seeking ordination in the Roman Catholic Church. The present buildings date from 1846.

MAYOR, the chief magistrate of a city, borough, or municipal corporation, and president at meetings of the council. The

Sculpture representing a sacrifice to the god Kukulkan, a specimen of Mayan art

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Mayors of London, Birmingham, Liverpool, Manchester, Sheffield, Leeds, Bristol, Hull, Bradford, Newcastle, Nottingham, Portsmouth, Stoke-on-Trent, Leicester, Plymouth, Cardiff and Norwich have the title of Lord Mayor.

MECHANICS, the study of natural forces and their application to human purposes by means of machines. In a more restricted sense it may be regarded as the science of machinery.

MEDAL, a piece of metal, usually circular in shape, issued to commemorate some important event or in recognition of services. The largest class of medals is the military, which includes those issued to all persons who have taken part in a war, or are conferred on individuals for special reasons. Among the last the most coveted is the Victoria Cross. Another class covers all medals given by institutions, societies and associations. To this belong such medals as those of the Royal Humane Society, the Albert Medal, and the Gold Medal of the National Rifle Association.

MEDICI, a family which, from the fourteenth to the sixteenth century, played a leading part in the history of Florence. Two members of it became Popes as Leo X and Clement VII.

MEGAPHONE, a conical tube held in front of the mouth to concentrate sound in one direction and make speech carry farther.

MEMORIAL. — Modern monuments often take serviceable forms such as the beautiful Menin Gate, in Belgium; Grundtvig Church, Copenhagen; and the Shakespeare Memorial Theatre at Stratford-on-Avon.

MENAI BRIDGES. — The first bridge spanning the Menai Straits between Wales and Anglesey was the Suspension Bridge forming a link in the Holyhead road, constructed by Telford in 1819-1825. In 1850 the "double-barrelled" tubular railway bridge of Robert Stephenson was opened. Both have remained in constant use since their completion.

MERCURY, or QUICKSILVER, one of the elements, is the only metal that remains liquid at ordinary atmospheric temperatures. It is over 13½ times as heavy as water. The chief source of the metal is its oxide, cinnabar. It dissolves most other metals, and this quality makes it very useful for extracting gold and silver from sand, gravel or pulverized ore.

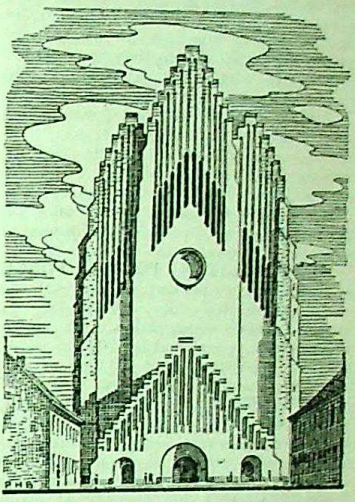
MERCURY, PLANET, is the planet nearest to the sun, which it encircles once in 88 of our days. It is much smaller than the earth, having a diameter of 3,000 miles.

MERIDIAN, an imaginary line passing through a place from pole to pole. The sun crosses the meridian at midday or "local noon" of the place.

MERIT, ORDER OF (O.M.), an order established in 1902, and conferred on eminent persons, military and civil. Its membership is limited to twenty-four.

MESMERISM.—*See* HYPNOTISM.

METALLURGY, the science of metals, includes processes of extracting metals from ores, and preparing them for use, either singly or alloyed together. It also explores the structure of metals, and their behaviour under stresses of various kinds.



Grundtvig Church, Copenhagen, built as a memorial to Bishop N. F. S. Grundtvig

METEOROLOGY is the science which has the atmosphere as its subject. It makes use of apparatus and instruments for measuring and showing alterations in temperature, pressure and moisture, and studies the factors which produce weather changes, storms, rain, drought and so on. One of its chief fields is the prediction of weather by the comparison of data telegraphed from many land stations and ships. Aviation gave meteorology increased importance as regards both forecasts and the mapping of air currents.

METHODISTS are members of those particular religious denominations which are based on the teaching of John Wesley in the earlier half of the eighteenth century. Owing to differences with regard to organization, doctrine, ritual, etc., various Methodist bodies came successively into existence — Wesleyan Methodists, Primitive Methodists, United Methodists,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

etc. In September, 1932, the Methodist Churches signed an Act of Union in the Royal Albert Hall, which amalgamated them into a single Church under a president.

METHYLATED SPIRIT, alcohol rendered undrinkable by the addition of nauseous liquids.

METRIC SYSTEM, the system of weights and measures, based on the metre, set up in France in 1801. It has been adopted by all European countries except Britain. The standard of length, the metre, is subdivided into 10 decimetres, 100 centimetres and 1,000 millimetres, and has as multiples the dekametre, hectametre and kilometre (10, 100 and 1,000 metres respectively). The standard of weight is the kilogram (2.205 lb.), and that of volume the litre (1.76 pints). These are connected directly with the metre. The litre is a cubic decimetre, and the kilogram the weight of a litre of distilled water at a standard temperature.

METROPOLITAN POLICE FORCE is responsible for policing London with the exception of the City, which has its separate police organization. Its activities cover an area of about 700 sq. miles, with a population of 8,000,000. Headquarters: New Scotland Yard, S.W.1.

METROPOLITAN WATER BOARD, the public authority created in 1902 to take over the several companies supplying London with water. It distributes about 332,000,000 gallons daily among over 7,000,000 people. Its network of mains covers an area of 540 sq. miles.

MICA, a mineral which splits readily into thin, transparent sheets. It resists heat, and is a good electrical insulator. The sheets are used in stove doors and for lamp chimneys.

MICHAELMAS DAY, September 29, is the third quarter-day of the year in England.

MICROBE, a tiny living creature, animal or vegetable. Many microbes, also called bacteria, are disease germs. (*See* BACILLUS, BACTERIOLOGY.)

MICROMETER, an instrument for making very small measurements. The micrometer gauge used by mechanics is shaped somewhat like a horseshoe. On one side of the opening is a movable piece which can be moved forward or backward by turning a graduated screw. With this, differences in length or diameter as small as 1/10,000th inch can be detected.

MICROPHONE, an apparatus for magnifying or transmitting sounds by causing fluctuations in an electric current. The microphone of an ordinary telephone consists of a number of carbon grains, packed between two plates which are connected with the circuit. The front plate, at the bottom of the conical mouthpiece, is vibrated by the voice, and by pressing on the carbon grains with varying force, makes their electrical resistance alter correspondingly; so that a steady flow through the grains is converted into a series of pulsations, which are transformed back into sound vibrations by the receiving apparatus at the other end of the circuit. Microphones operating on different principles are used for broadcasting. (*See* TELEPHONE.)

MICROSCOPE, an optical instrument for producing greatly magnified images of very small objects, consists, in general principles, of a tube with a very short-focus lens, called the objective, at one end, and an assemblage of lenses, named the eyepiece, at the other. The objective throws a large image towards the eyepiece, which catches and enlarges it again. Since the microscope renders visible objects far too small to be distinguished by the naked eye, it has been of immense use in increasing our knowledge of the structure of substances; and in bringing to light tiny organisms, such as bacteria and blood corpuscles.

MIDAS, according to old Greek legend, was a king of Phrygia who, in return for kindness to Silenus, the servant of Bacchus, was granted the power of turning everything he touched into gold. But when he found that even his food became gold, and that he was starving to death, he prayed to have the power removed, and was released from it by bathing in the River Pactoles.

MIDDLE AGES, the period of European history lasting from the fall of the Roman Empire, towards the end of the fifth century, until about the end of the fifteenth century, when the Renaissance began.

MIKADO, the personal title of the Emperor of Japan. The Japanese prefer the official title, Tenno, meaning "Gate of Heaven," and anglicized as "Emperor."

MILE.—The Roman mile was 1,000 (Latin, *mille*) paces of 5 ft. The English *statute* mile is 1,760 yards. The *geographical* mile is 6,076.8 ft.; the *sea-mile*, or Admiralty knot, 6,080 ft. (2,026⅔ yd.).

MILKY WAY, or GALAXY, the vast star system amid which the earth is. Its general shape is that of a thick disc. A spectator looking towards the rim of the disc sees an enormous number of stars apparently bunched together, though they actually are far apart and at different distances from the earth. Hence the heavens seem to be girdled by a luminous belt. The number of the stars in the Milky Way can only be guessed at.

MILLET, a grass, the small seed of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which is a very important article of food in India, Africa and other hot countries.

MINERVA, an ancient Roman goddess, equivalent to the Greek Athene. She was the goddess of wisdom, the arts, trade and war.

MINNESINGERS, German poets of the twelfth and thirteenth centuries, who travelled the country to recite their compositions.

MINOTAUR, a fabulous monster of ancient Greek legend, having a bull's head and a man's body. He was imprisoned by Minos, King of Crete, in a labyrinth, and given boys and girls as his prey. Theseus, assisted by Ariadne, killed him. (*See* ARIADNE, LABYRINTH.)

MINT, an establishment in which money is coined by or for a government. Most British coins are produced at the Royal Mint, on Tower Hill, London, which was opened in 1811. In 1946 it issued 399,000,000 coins.

MIRACLE PLAYS were religious plays very popular during the Middle Ages. Originally they dealt only with miracles, but later made use of Biblical incidents in general. Many of them were passion plays, of which that still performed at Oberammergau is a surviving instance.

MISSAL, the service book used by Roman Catholics. It may be regarded as the counterpart of the Anglican Book of Common Prayer.

MISSEL-THRUSH, or MISTLETOE-THRUSH, is a rather larger bird than the common song thrush, and has lighter plumage. It is also called the "storm cock," from its habit of singing in stormy weather.

MISTLETOE is a parasitic plant, growing on the branches of apple, oak, elm and other trees, and rooting itself in crevices in the bark. Pliny records that it was much revered by the Druids, and many old legends tell of its magical powers.

MISTRAL, a cold winter wind which sweeps down on to the Mediterranean coasts of France and N. Italy from the Alps and the high ground of Central France.

MOABITE STONE, a slab of black basalt, discovered in 1868 in Eastern Palestine, the old Land of Moab. It bears the earliest known inscription in the Phœnician language, recording the victory of Mesha, King of Moab, over the Israelites in 890 B.C.

MOCKING BIRD, an American thrush which mimics the calls and songs of other birds with great fidelity.

MOHAMMEDANISM, the religious system founded early in the seventh century by Mohammed (Muhammad). The Koran is its Bible (*see* KORAN); Mecca is its holiest centre. Its creed may be summarized as belief in one God only, and in Mohammed as his prophet or interpreter. It imposes prayer five times a day, fasting, alms-giving, recitation of the Moslem creed and pilgrimage to Mecca. Mohammedanism made rapid headway among the Arabs, and later among the Persians and the Turks. From the eleventh century onwards it spread over India, and penetrated into South-eastern Asia. It is now the creed of over 200,000,000 human beings.

MOLASSES, the uncrystallizable syrup left when raw sugar is boiled down. Also called black treacle.

MOLECULE, the smallest possible part of a substance that has the properties of that substance. It may consist of one atom, or of a pair of similar atoms, in the case of an element; or of two or more dissimilar atoms in a chemical compound.

MONEY is a medium of exchange and measure of value which does away with the inconveniences of direct exchange or barter of goods. In civilized countries it takes the form of coins, or of paper documents, exchangeable for coins. Among uncivilized races, beads, plugs of tobacco, brass wire, packets of tea, and other things which are valued more than coins, because they can be made practical use of, circulate as money.

MONGOLS are the yellow-skinned races of mankind, also distinguished by their somewhat slanting eyes, flat features and straight hair. The Mongol type is most prevalent in China, Japan, Tibet and E. Siberia, and is noticeable in the Malays, Eskimo and some American Indians.

MONGOOSE, a carnivorous weasel-like animal found in S. Asia and in Egypt (where it is called ichneumon) and other parts of Africa. It does man valuable service by feeding on poisonous snakes, which it kills skilfully. It makes a docile pet.

MONOLITH, a very large single stone used as a column or pillar. Cleopatra's Needle is an example of a hewn monolith. Some of the stones of Stonehenge are unwrought monoliths.

MONORAIL, a single-railed railway track. The rail may be overhead, and have the vehicles hung from it; or a few feet above the ground, with the vehicles straddling it; or on the ground. In the last case, balance has to be maintained by a gyroscope or overhead guides.

MONROE DOCTRINE, the statement made by President James Monroe (1758-1831) in 1823, to the effect that the United States would henceforward not tolerate the further colonization of the New World by European Powers.

MONSOONS, seasonal winds which blow across India and S.E. Asia from the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

S.W., bringing rain, from May to September; and from the N.E. from October to April. A "good" monsoon is of immense importance to Indian crops.

MONTH.—A calendar month is one of the arbitrary 12 divisions of the year, totalling 365 days. A lunar month is the time (29.53 days average) between one new moon and the next. A sidereal month, the circuit of the moon as shown by the stars, occupies 27.32 days.

MONUMENT, THE LONDON, is a fluted Doric column, 202 ft. high, near the north end of London Bridge. Erected by Sir Christopher Wren (1632-1723) to commemorate the Great Fire of London, which started in a house close by. It can be ascended by an internal staircase.

MOON, THE, is the one satellite of the earth. Some of the other planets also have moons: Jupiter eleven, Saturn nine, Uranus, five. Our moon is distant from the earth 238,835 miles on the average, is about 2,160 miles in diameter, has no atmosphere and, being unable to revolve on its own axis owing to the pull of the earth, always turns the same side towards us. Being quite cold, it emits no light of its own, but acts merely as a mirror, reflecting sunlight from that part of its disc which is not eclipsed by the earth.

MOORS, a N. African race of mixed Arab and Hamitic blood, which adopted Mohammedanism and in 711 crossed the Straits of Gibraltar, defeated the Visigoths, and for 100 years was master of the whole country. The Moors were then driven south to the Ebro, and for the next century that river was the boundary between Christian and Moslem Spain. Later they were pushed gradually farther south until they held only Granada, from which they were expelled in the year (1492) in which the New World was discovered. Henceforth for nearly three centuries they were the terror of the Mediterranean as corsairs, sallying out from N. African ports. While masters of Spain they proved themselves great agriculturists, artists and architects.

MORAVIANS, or MORAVIAN BRETHREN, a Christian Protestant sect formed in Moravia (east of Bohemia) in the fifteenth century. Greatly persecuted by Rome, they settled in Silesia, Germany, in 1177, and organized what may be called the modern Moravian Church, which has adherents mainly in Germany, America and England. Though comparatively few in numbers, the Moravians have been and are very prominent in the mission field.

MORMONS, or LATTER DAY SAINTS, a sect founded in Ohio, U.S.A., in 1833 by Joseph Smith, who claimed to have received revelations in the "Book of Mormon" found and translated by him. He and his followers made themselves unpopular by their doctrines and behaviour, and in 1845 the Mormons, under Brigham

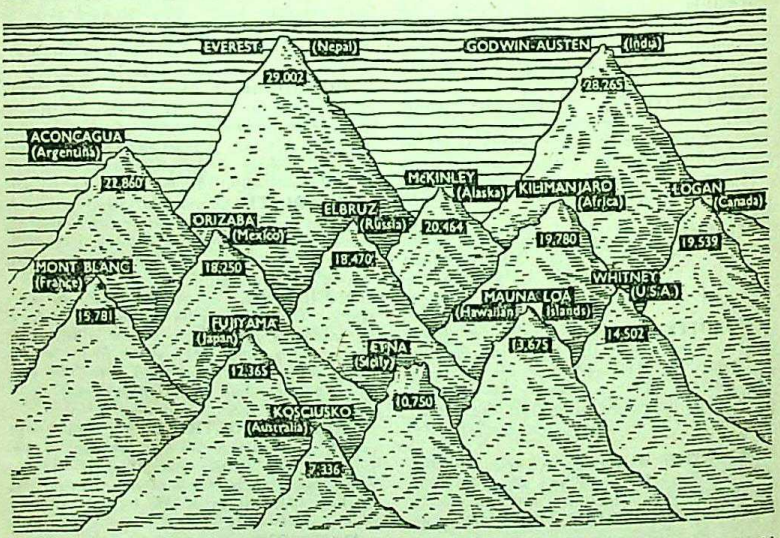


Diagram showing comparative altitudes of some of the highest mountains in the world

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Young, Smith's successor, migrated to Utah and founded Salt Lake City, which has been their headquarters ever since.

MORSE CODE, the signalling code of "dots" and "dashes" or "shorts" and "longs," invented in 1837 by S. F. B. Morse, and since that time adopted for telegraphic and other modes of signalling.

MORTGAGE, a means of raising money by giving a security on land or houses. The borrower, called the mortgagor, enters into an agreement with the lender, the mortgagee, under which a certain rate of interest is agreed on. The deeds of ownership of the property mortgaged are usually handed to the mortgagee, to be held by him till the loan has been repaid.

MOSQUITO, or GNAT, a blood-sucking fly, the bite of which causes great irritation and, in the case of certain species, spreads the germs of malaria and yellow fever. Some parts of the world are rendered almost uninhabitable by swarms of mosquitoes.

MOTHS form one of the two great groups of the Lepidoptera. They are distinguished from butterflies by their thicker bodies, by the absence of knobs on the tips of their antennæ, and by their wings lying flat when folded instead of being vertical. Most of them fly chiefly by night.

MOTOR VEHICLES, vehicles propelled by internal-combustion motors, range in size from the lightweight motor cycle to the special lorry able to move loads of up to 100 tons.

Some motor vehicles are provided with "caterpillar" tracks which enable them to travel over soft ground. Their increase in number and weight has revolutionized road construction (*see* ROADS); their manufacture has become one of the greatest of modern industries; and the mobility which they confer has had great effects on social life.

MOUNTAINS, HIGHEST. — British Isles: Ben Nevis, 4,406 ft. Europe: Mt. Blanc, 15,781 ft. Asia: Mt. Everest (Himalayas), 29,002 ft. Africa: Kilimanjaro (Tanganyika), 19,780 ft. N. America: Mt. McKinley (Alaska), 20,464 ft. S. America: Aconcagua (Andes), 22,860 ft. Australasia: Mt. Cook (N. Zealand), 12,348 ft. Kamet (25,430 ft.) in the Himalayas is the highest peak yet climbed; but a much greater elevation was reached during the last attempt to conquer Mt. Everest, in 1924.

MULE, the hybrid offspring of a male ass and a female horse. It has a stronger constitution than a horse, is extremely sure-footed, and is much used in many countries, especially mountainous ones, as a beast of burden.

MULLAH, a Mohammedan official, who combines the duties of magistrate, priest, lawyer and teacher.

MUMMIES, the bodies of human beings or animals preserved by embalming and swathing in linen bandages. Some of the Egyptian mummies discovered are 5,000-6,000 years old.

MUSES, nine goddesses of Greek mythology who presided over various branches of literature, poetry, and science, as follows: Clio, history; Euterpe, lyric poetry; Melpomene, tragedy; Thalia, comedy; Terpsichore, dancing; Erato, love poetry; Polyhymnia, sacred poetry; Calliope, epic poetry; Urania, astronomy.

MUSQUASH, or MUSK-RAT, a rodent of the vole family, a native of the New World. It has found its way into Europe and become a serious pest on account of the damage it does by burrowing into embankments. It is hunted for its fur.

NANTES, EDICT OF, issued by Henry IV of France in 1598, gave the Huguenots (Protestants) freedom of worship, and political rights which had previously been refused them.

NAPHTHA, a volatile and highly inflammable liquid obtained by distilling petroleum, coal tar, shale oil or wood.

NAPHTHALENE, a solid white hydrocarbon derived from coal tar. Used as an insecticide and in the manufacture of dyes.

NARCISSUS, in old Greek legend, a beautiful youth who fell in love with his own reflection, wasted away and was changed into the flower named after him.

NARCOTICS are drugs, such as opium and morphia, which produce sleep, and are used in medicine to alleviate pain.

NARWHAL, or SEA-UNICORN, is a large dolphin armed with a single straight tusk several feet long. It is hunted for its blubber and the ivory in the tusk.

NATIONAL ANTHEM, a patriotic hymn sung at ceremonies and gatherings. Britain's, "God Save the King," is of doubtful origin, but the music was probably composed by Dr. John Bull (*c.* 1563-1628). It became popular in 1745, during the Jacobite Rebellion of that year. The American anthem, "My Country, 'tis of Thee," is sung to the same tune.

NATIONAL DEBT, the money borrowed by a country for national uses and remaining unpaid. The nominal amount of Britain's National Debt, at the end of March, 1946, stood at £23,774,000,000.

NATIONAL GALLERY, on the north side of Trafalgar Square, was opened in 1838, and has been enlarged at different times since. It houses a great collection of pictures belonging to the nation, distributed according to period in different rooms. The "National Gallery, Millbank," formerly known as the Tate Gallery, after

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sir Henry Tate, the donor of the building and many of the pictures in it, is a branch of the older institution. The National Portrait Gallery, adjoining the National Gallery, was opened in 1896, to contain a collection of portraits of people of all ranks, professions and periods, who have played a part of Britain's national history and development.

NATIONAL RIFLE ASSOCIATION, formed in 1860 to raise the standard of rifle shooting among volunteers, holds annual meetings at Bisley, attended by competitors from all parts of the Empire.

NATURAL HISTORY MUSEUM, South Kensington, London, was opened in 1881 to accommodate natural history collections removed from the British Museum —of which it is a branch. These collections have since been greatly added to, and are now among the finest of their kind in the world.

NATURALIZATION, the formal and legal process whereby a person becomes a subject of a country other than that to which he formerly owed allegiance.

NAUTICAL ALMANAC, a volume issued annually by the Admiralty, containing tables and calculations useful to navigators and astronomers.

NAZI, a member of the National Socialist Party (NAtional SoZIalistische), a German organization founded by Anton Drexler in March, 1918, and originally called the Committee of Independent Workmen. Adolf Hitler associated himself with the movement, which he reorganized. There were 12 Nazis in the Reichstag (Parliament) in 1928, 107 in 1930, and 231 in 1932. The party was then stronger than the Social Democrats (133) and the Communists (89) combined, and early in 1933 Hitler was made Chancellor by President Hindenburg.

NEAP TIDES.—*See* TIDES.

NEBULÆ are luminous bodies in the sky, some of which are star systems similar to the Milky Way, and other irregularly shaped masses of luminous gas and dust.

NEGROES are distinguished by their very dark, and in some cases black, skin, short, curly black hair, large thick lips and short, flat nose. Most of the true Negroes are found near the equator in Africa, and in the West Indies and United States, where they are the descendants of slaves shipped from Africa to work on the plantations. (*See* MANKIND, RACES OF.)

NELSON MONUMENT, THE, Trafalgar Square, London, was erected in 1849 in honour of the great admiral. It is 145 ft. high, and carries a bronze statue of Nelson 16 ft. high.

NEMESIS, in Greek mythology, the goddess who humbled the pride of the over-prosperous.

NEOLITHIC AGE, the later period of the Stone Age, during which man learned to make well-shaped and highly-finished stone tools and weapons. (*See* STONE AGE.)

NEPTUNE, identified with the Greek Poseidon, was the Roman god of the oceans. His sceptre was a trident.

NEPTUNE, PLANET, discovered in 1846, is the most distant from the sun of the planets, with the exception of the recently-discovered Pluto—the actual distance being 2,793,000,000 miles. Its volume is 72 times that of the earth, and its period of encircling the sun nearly 165 years. It has one moon.

NEWGATE PRISON stood on the site of the present Central Criminal Court, facing the Old Bailey, which connects Ludgate Hill with Newgate Street. It was pulled down in 1904.

NEW RIVER, an aqueduct constructed by Sir Hugh Myddleton in 1609-1613 to bring water from springs in Hertfordshire to Clerkenwell, London. It was originally 40 miles long, but has since been considerably shortened.

NIAGARA FALLS, the most celebrated of waterfalls, passes most of the excess water from Lakes Superior, Huron, Michigan and Erie. It is in two parts, separated by Goat Island; the American Fall, 1,060 ft. wide, and the Canadian or Horseshoe Fall, 3,010 ft. wide. The average drop is about 160 ft. Much water is drawn off above the Falls, and discharged below them, after operating turbines in large electricity generating stations.

NICKEL, a hard white metal, one of the elements. It takes a bright polish and tarnishes very slightly, and on this account is much used for electro-plating copper and iron. Alloyed with steel it makes a very tough steel.

NICOTINE, a poisonous alkaloid substance present in tobacco, and responsible for any ill-effects produced by smoking.

NIGHTINGALE, a little brown bird which visits a large part of England during the spring and summer. The male is famous for his nightly song.

NIGHTJAR, or FERN OWL, a bird of about the size of a pigeon, with dark mottled plumage, which utters a jarring cry in the dark and at night. It is also called goat-sucker, as an old superstition credited it with sucking the milk of goats.

NILE, BATTLE OF THE, also called the Battle of Aboukir Bay, was fought on August 1, 1798, between an English fleet, under Nelson, and a French fleet. The latter was annihilated, and the victory

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

shattered Napoleon's schemes for an invasion of India.

NITRE, or SALTPETRE, is nitrate of potassium, used chiefly in the manufacture of gunpowder and fireworks, and for preserving meat.

NITRIC ACID, a chemical combination of hydrogen, nitrogen and oxygen, is an extremely powerful corrosive, formerly called aquafortis or "strong water." It is used for etching metal, and in the manufacture of nitro-glycerine and other explosives.

NITROGEN, a gas, one of the elements, which is mixed with oxygen in the atmosphere, of which it forms about four-fifths. Though it does not ordinarily combine easily with other elements, it enters into combination with oxygen, hydrogen and metals under certain conditions.

NITRO-GLYCERINE, a very powerful explosive made by treating glycerine with sulphuric and nitric acids. For use it is mixed with kieselguhr as dynamite, or with gun-cotton, as blasting gelatine.

NOBEL PRIZES.—When Alfred Nobel, the inventor of dynamite and smokeless powder, died in 1896 he left his great fortune of £1,750,000 to found five prizes to be awarded annually to the five persons of any nations who should have distinguished themselves particularly in (1) Physics; (2) Chemistry; (3) Medicine or Physiology; (4) Literature; (5) in promoting World Peace. The first award was made in 1902.

NONCONFORMISTS is the general name for members of those religious sects which have separated themselves from the Church of England. Originally the word meant those who in 1662 refused to submit to the Act of Uniformity.

NONES, in the Roman calendar, meant the fifth day of all the months except March, May, July and October, in which it was the seventh day.

NOON signifies strictly the moment at which the sun crosses the meridian of any particular place; that is, reaches its highest point in that longitude. As it would cause confusion if every place set its clocks by "local" noon, the earth has been divided into north and south belts, throughout each of which a certain moment is regarded as noon. In England we take Greenwich noon as the standard.

NORMAN ARCHITECTURE signifies the style of architecture that was prevalent in England from the Norman Conquest until the end of the twelfth century. It is characterized by semi-circular arches, massive pillars and, on the whole, pleasing simplicity and dignity. The later Norman styles were decorated with somewhat elaborate mouldings. Notable examples are Durham and Gloucester Cathedrals and Tewkesbury Abbey. In Normandy architecture developed along somewhat different lines, extreme attention being paid to details of construction.

NORTHMEN, or NORSEMEN, is the general name for the Scandinavians who invaded Britain and Western Europe in the ninth and tenth centuries. They were also called Vikings, which means "men of the vik," or creek, and some of them may be identified with the Danes.

NOTRE-DAME ("Our Lady"), the great cathedral church of Paris, erected in the twelfth century and dedicated to the Virgin Mary.

NOVEMBER, the eleventh month of our calendar year, but the ninth of the Roman year.

NUMISMATICS, the study of coins and coinage. It is a great help to historical research, as coins give an indication of what nations were in occupation of, or traded with, certain countries at certain dates. Thus, Greek coins found in India prove that that country was invaded by Alexander in the fourth century B.C.

NUNC DIMITTIS ("Now Thou Dismissest") are the opening words of the Song of Simeon (Luke ii, 29-32), which is sung as a canticle in the Order of Evening Prayer of the Church of England.

NUTHATCH, a small, greyish bird which nests in a hole in a tree, plastering the entrance with mud to a size which just gives admission. It gets its name from its habit of wedging nuts in the corrugations of a tree's bark when breaking them open.

NUTMEG, the hard kernel or stone of the fruit of a Moluccan tree. (*See* MACE.)

OAK, the typical English forest tree, noted for its tough, durable timber, of which the "wooden walls of England" (old warships) were built. If given plenty of room it is a handsome, spreading tree. Its bark is valuable for tanning, and its seeds —acorns—make a good food for pigs.

OASIS, a fertile spot in a desert, where water comes to the surface. The oases of the Sahara are marked by groves of date palms, which in some cases number tens of thousands.

OAT, a cereal plant which flourishes in damp and cold climates unfavourable to wheat. The grain, which is spiked, yields oatmeal, used for porridge and oatcake, and is a food for horses and cattle.

OBELISK, a tapering, four-sided column crowned with a pyramidal top. Usually hewn out of a single mass of stone. (*See* CLEOPATRA'S NEEDLE.)

OBERON, the King of the Fairies, who plays an important part in Shakespeare's *Midsummer Night's Dream.*

OBSERVATORIES are buildings

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

equipped with apparatus for making astronomical, meteorological, or other observations and records. (*See* TELESCOPE.)

OBSIDIAN, a glass-like lava, which in prehistoric times was used for making knives (Latin *obsides*) and arrow-heads.

OCEANS are those large bodies of water which cover about five-sevenths of the surface of the earth. As they run into one another, their limits are very indefinite. The main oceans are the Pacific, Atlantic and Indian, the areas of which are about 64,000,000, 31,500,000 and 28,000,000 square miles respectively. Their average depth is 12,000 ft.

OCTOBER, now the tenth month of the year, was the eighth month of the Roman or Julian year.

OCTOPUS, a mollusc with eight arms.

ODIN, or WODEN, was the chief god of the old Teutonic peoples. Our Wednesday (Woden's Day) is named after him.

ODOMETER, an instrument which shows the distance travelled by a wheel over a road or other surface. The speedometer of a motor car includes an odometer, which registers miles and fractions of a mile.

ODYSSEUS (in Latin, Ulysses) was one of the leaders of the Greeks in the Trojan war. He displayed great resource and cunning, and suggested the Wooden Horse, inside which he entered Troy. After the fall of that city he wandered for ten years during his return home. His many adventures are told in Homer's *Odyssey*. (*See* PENELOPE, WOODEN HORSE.)

ŒDIPUS, in Greek legend, a king of Thebes, in Bœotia. While an infant he was abandoned on a hillside by his father, Laius, who had been warned by an oracle that he would be killed by his son. Œdipus was found and brought up by a shepherd, and adopted by the King of Corinth. At Delphi he met his father and slew him, not knowing who he was. Going to Thebes, he slew the Sphinx, married Jocasta and became ruler. A pestilence broke out, and the Delphic oracle declared that it would not cease till the murderer of Laius had been banished. Œdipus then learned from a seer that he was the man, and had married his own mother. In despair, he blinded himself, and Jocasta killed herself. His story forms the subject of two of Sophocles' tragedies, *Œdipus Rex* and *Œdipus Coloneus*.

OGPU, the Soviet Russian secret police, for long entrusted with the prevention of espionage and counter-revolution. The word is made up of the initials of the four long Russian words comprising the full title.

OIL-CAKE is a cattle food made by compressing cotton seed and linseed, from which oil has been extracted, into corrugated slabs. In some cakes other seeds are used. The cake is broken in a special machine before being fed to animals.

OILS are greasy liquids obtained either (1) from seeds or animal fats, or (2) from petroleum and oil shale. Those of the first class, called vegetable and animal oils, include linseed, cotton seed, castor, rape, coconut, olive, almond, seal, cod-liver and whale oils. Some of them are nutritious and used in cookery. The mineral oils are pure hydrocarbons, and have no value as food. Oils of both classes are used, either singly or mixed, as lubricants for machinery.

OLD BAILEY.—*See* NEWGATE PRISON.

OLIVES are the fruit of a tree that is a native of countries bordering the Mediterranean, and now cultivated also in other parts of the world. Unripe olives are salted and sold for table use. Ripe olives are pressed to extract the oil which they contain.

OLYMPIA (1) on the River Alpheus, near the west coast of S. Greece, was the scene of the Olympic Games. (2) The building of the same name, in Hammersmith Road, London, opened in 1886, is now a great centre for exhibitions and public entertainments on a large scale.

OLYMPIAD, a period of four years between two successive celebrations of the Olympic Games. The ancient Greeks reckoned dates by Olympiads.

OLYMPIC GAMES, the great athletic meetings in ancient Greece, began at an unknown date. What may be called the first historical games were celebrated in 776 B.C., and thenceforward the Games were held every fourth year for about 1,000 years. To be declared the winner at the Games was the ambition of every Greek, as the victor won great glory and considerable wealth. The modern Olympic Games, which are international, were held first in 1896. (*See* OLYMPIA, OLYMPIAD.)

OLYMPUS, a peak nearly 10,000 ft. high in a range of mountains between ancient Thessaly and Macedonia in Greece. It was believed to be the home of the gods.

OMNIBUSES were first seen in London streets in 1829, when George Shillibeer ran a service between Paddington and the Bank of England.

OOLITE, limestone composed of small round grains suggestive of the eggs in a fish's roe. One variety, very valuable for building purposes, is named Portland stone.

OPAL, a form of silica, which shows various colours when viewed at different angles. Opals of the best quality are used in jewellery.

OPERA, musical drama, accompanied by an orchestra and suitable scenery. All the words of an opera are sung, except in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

what is called comic opera, and each scene or act is usually introduced by an orchestral overture. The first operas were written in the sixteenth century, in Italy.

OPHTHALMOSCOPE, an instrument for examining the interior of the eye by projecting light into it.

OPIUM, a drug made from the unripe seeds of a certain species of poppy, cultivated in India, China and elsewhere. It is smoked in tiny pipes in the East. Laudanum and morphia, prepared from opium, are powerful narcotics.

OPOSSUM, a quadruped found only in America, which lives in trees. It has a hairless, prehensile tail and long fur. The females of all species carry their young in a pouch.

OPTICS, the science of light and vision. It includes the study of the reflection of light from surfaces, and the refraction, or bending, of rays when they pass from one medium to another. Discoveries in optics have given us spectacles for correcting defective sight, and telescopes and microscopes for magnifying objects.

OPTOPHONE, an instrument for enabling blind people to read ordinary printed matter. It employs beams of light, a selenium cell and a telephone headpiece, worn by the reader. Different letters give rise to different sounds as they pass under the beams, and practice renders them easily distinguishable.

ORANGEMEN, the extreme Protestant Party of Northern Ireland, named after William of Orange (William III). On July 12 they celebrate the anniversary of the Battle of the Boyne, won by William on that day in 1690.

ORATORIO, a musical drama of a sacred character, performed without costume or scenery, but to orchestral accompaniment. As in grand opera, all the words are sung or recited. Handel's *Messiah*, Haydn's *Creation* and Mendelssohn's *Elijah* are special favourites in England.

ORCHESTRA, a body of musicians playing a variety of instruments, among which stringed instruments played with a bow usually predominate.

ORDERS, HOLY, the status or rank of a clergyman. The Church of England recognizes three degrees of holy orders—bishops, priests and deacons. The Church of Rome has what are called "minor" orders as well: sub-deacons, acolytes, exorcists, etc.

ORDER-IN-COUNCIL, a law issued by the sovereign on the advice of his Privy Council. It is normally used only in emergencies or in cases where an Act of Parliament purposely leaves the details of its application to be worked out afterwards.

ORDNANCE SURVEY, the very careful mapping of the country, carried out by order of the Government. It was begun in 1783, from a great base line laid out on Salisbury Plain, by the military Board of Ordnance. The original maps obtained have been amplified and corrected from time to time. The survey is now controlled by the Ministry of Agriculture and Fisheries and actual surveying operations are in the hands of a section of the Royal Engineers.

ORES are rock-like substances containing metals, either pure in a finely divided form, or in chemical combination with other elements.

ORION, a great constellation, which includes Betelgeuse, one of the largest stars known, and Rigel, one of the hottest and most brilliant. It is named after a famous hunter of old Greek legend.

ORNITHOLOGY is the branch of zoology which studies the structure, species and habits of birds.

ORPHEUS, according to old Greek legend, was the son of the muse Calliope. So fascinatingly did he play on the lyre that birds and beasts, and even trees, would follow him. (*See* EURYDICE.)

OSPREY, or FISH-HAWK, a large British bird of prey with white, black and brown plumage; lives chiefly on fish.

OSTRACISM, a system used in ancient Greek cities to prevent any citizen becoming too powerful. Every year all voters were summoned to write on potsherds or shells the names of persons deserving banishment. Anyone who had a certain number of votes given against him was expelled for a period of years.

OSTRICH, the largest of birds, is a native of African, Arabian and Syrian sandy deserts. The male stands 7-8 ft. high. Its wings are too small for flight, but its long, powerful legs enable it to run faster than a horse can gallop. The tail and wing plumes were formerly in such demand that ostrich farming was a flourishing industry in S. Africa.

OTTAWA CONFERENCE, an economic conference of delegates from all parts of the Empire held at Ottawa in July and August, 1932, to consider means of improving the internal trade of the Empire generally by mutual concessions as regards tariffs and preferences.

OTTER, a carnivorous animal which lives largely in the water and feeds chiefly on fish. It is 2-2½ ft. long, excluding the tail, and has valuable glossy fur. When not in the water it inhabits a burrow in a river bank.

OTTOMANS, Turks who came from Central Asia and, under Othman I, established themselves in Asia Minor in the early part of the fourteenth century. They

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

later invaded Europe and occupied a large part of the Balkan Peninsula. In 1453 they took Constantinople and made it the centre of the Ottoman Empire, or Turkish Empire, as it was afterwards called.

OWLS are nocturnal birds of prey, with large eyes surrounded by rings of feathers which give them a wise look. They fly very silently while hunting, and live mainly on mice, rats, small birds and beetles. There are five British species, of which the Barn Owl is the commonest.

OXFORD UNIVERSITY has 22 colleges for men and 4 colleges for women, and about 4,800 undergraduates in residence. University College, founded in 1249, is the oldest college, followed by Balliol (1262) and Merton (1264). The oldest of the colleges for women is Lady Margaret Hall, founded in 1878.

OXYGEN, a colourless and odourless gas, one of the elements, was discovered by Joseph Priestley (1733-1804) in 1774. It forms a fifth part of the atmosphere, and is essential to life both for breathing and as being one of the two components of water. When combining with other elements, especially carbon, it generates heat, while causing them to "burn." The heat of our bodies is due to the combination of oxygen with food substances—that is, to their very slow combustion.

OYSTER, a two-shelled shell-fish, one species of which is regarded as a delicacy. Other species are the pearl oyster, from which pearls are obtained and that which has its shells thickly lined with mother-of-pearl.

OYSTER-CATCHER, a handsome bird with red feet, long legs and long yellow beak, which haunts the water's-edge on seashores, and lives on shell-fish, worms and small fish.

OZONE, a form of oxygen containing three atoms in the molecule instead of the usual two. It is present in the atmosphere in small quantities. An electric discharge generates ozone in its neighbourhood. The gas has a rather pungent smell.

PACIFIC OCEAN, the largest and deepest of the oceans, has an area of about 64,000,000 sq. miles, and a greatest depth of over 32,000 ft.

PALANQUIN, a litter or enclosed chair, used in Japan and China. It is attached to a pole carried on the shoulders of two or more men. The eastern counterpart of the old sedan chair.

PALIMPSEST, a manuscript on a parchment from which an earlier manuscript has been erased. In old days parchment was so costly that it was often made use of a second time. By means of "X" and other rays it is sometimes possible to decipher the traces of the original writing.

PALL-MALL, a London street, crossing the south end of Lower Regent Street, from St. James's Street to Trafalgar Square. Named supposedly after an old ball game of Charles II's reign, it is now the chief centre of the great London clubs.

PALMISTRY is the so-called art of telling character and fortunes from the lines and other indications of the palms of the hands.

PALM SUNDAY, the Sunday next before Easter Day, commemorates Christ's entry into Jerusalem, when people threw palm branches in His path.

PAMPAS, the great grass-covered plains of S. America, especially in the Argentine, corresponding to the prairies of N. America.

PAN, in Greek mythology, the god of shepherds and their flocks; represented as having the hind legs and horns of a goat, and human body, arms, and head.

PAN-AMERICAN CONFERENCE, a yearly meeting of the 21 American republics that form the Pan-American Union, the policy of which is political and economic helpfulness.

PANTHEISM means two different things: (1) the view that God pervades all things, and cannot be conceived of apart from or above the material universe; (2) the nature-worship of the ancient Greeks and Romans, and other races, which peopled the oceans, streams, hills, trees, etc., with divinities of their own.

PANTHEON, an ancient Roman temple erected in honour of all the gods, and now a Christian church—Santa Maria Rotunda—in which are the tombs of many great Italians. The name also applies to a building erected in Paris in 1764-1789 as a mausoleum for illustrious Frenchmen.

PANTOMIME, a comic version of an old fairy tale, brought up to date by the introduction of modern appliances and topical allusions.

PAPER is a tissue made for writing on, wrapping, and many other purposes, by felting together vegetable tissues and other substances. Most of the paper produced today is made by machinery, which turns it out in the form of continuous strips, sometimes several miles in length, and the chief material used in its manufacture is wood-fibre.

Superior papers contain a certain percentage of linen, cotton and esparto-fibre. Wood is reduced to a form suitable for paper-making either by being ground up, or by being broken into chips and boiled with chemicals, and rolled out into sheets of what is called wood-pulp. The pulp and other fibrous material, after having been thoroughly disintegrated with water and bleached in a "potcher," are transferred to a "beater," when china clay, size and resin

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are added. After another thorough beating they pass through a narrow slit on to an endless belt of wire gauze, where they are shaken vigorously and freed from most of the water. The semi-dry film of pulp—the width and thickness of which are regulated by the slit and by guides on the gauge—travels over and between a number of steam-heated drums, which dry it and give it a more or less glossy surface. At the far end of the machine it is wound on to a roller.

PAPIER-MACHE is made either by gluing together many sheets of paper under pressure in moulds; or by pulping paper, mixing it with glue or starch, and moulding it. The substance is very tough and light, and is used for trays, decorative articles and decorations.

PARACHUTE, an umbrella-shaped apparatus which enables a person to descend to earth at a safe speed from a balloon, airship or aeroplane. Parachutes were used during the Second World War by soldiers (paratroops) to land from aircraft in enemy territory.

PARAFFIN is the name given to certain substances derived from petroleum and shale oil. Paraffin wax is a white solid, used for candles and in waterproofing; paraffin oil is a liquid, also called kerosene, used as fuel in oil-lamps, oil-stoves and oil-engines.

PARAVANE, an apparatus towed by a ship to cut the moorings of submarine mines or blow up submarines. Invented during the First World War by Commander (later Sir) C. D. Burney, R.N. In shape it resembles an aeroplane with its planes vertical. A paravane is attached to the bows by a cable on either side of the ship, and carries an explosive charge, or an apparatus for severing any mooring encountered by the cable.

PARCÆ, or FATES, three Roman goddesses who controlled the destinies of man. Clotho spun the thread of life, Lachesis decided its length and Atropos cut it.

PARCHMENT, a tough and very durable material for writing on, made from the skins of sheep, kids and goats.

PARIAH, meaning outcast, is a term applied to the Hindus of the lowest, or untouchable, caste.

PARIS, son of Priam and Hecuba, stole Helen from Menelaus and so provoked the Trojan War. An arrow shot by him killed Achilles.

PARLIAMENT, the legislative, and in some cases supreme judicial, assembly of a nation. The English Parliament, which has evolved by stages from the old Anglo-Saxon Councils, now consists of the Sovereign, the House of Lords and the House of Commons. The House of Lords consists of the royal princes, the hereditary peers of England, the representative peers of Scotland and Ireland, the two archbishops and 24 English bishops, totalling about 670 members. The House of Commons is normally elected every five years by the parliamentary voters of England, Wales, Scotland and Northern Ireland. A public Bill, that is, one affecting the community as a whole, may be introduced in either House, with the exception of money Bills—those relating to the raising and expenditure of money for national purposes, which must originate in the House of Commons and are never amended by the Lords. Theoretically, every Bill must be passed in due form by the Commons and Lords, and receive the Royal Assent before it becomes law. The Parliament Act of 1911, however, reduced the power of the Lords to throw out a Bill, by enacting that any measure submitted to them in three successive sessions, within two years, must become law. Some wish to reduce this period still further. The House of Commons is presided over by a Speaker, elected at the beginning of a Parliament; the House of Lords by the Lord Chancellor.

PARNASSUS, a high mountain near Delphi, in Greece, which the ancient Greeks regarded as the abode of Apollo and his oracle.

PARROT, a sub-order of tropical birds, including the cockatoos, macaws, lories and love-birds, all of which are distinguished by their brilliant plumage and powerful beaks.

PARSEES, a religious sect in India, which worships the sun and fire, and exposes the dead in Towers of Silence. Its headquarters is Bombay.

PARTRIDGE, a game bird, related to the domestic fowl, much esteemed as food. There are two English species: the brown, or English, and the larger and handsomer red, or French, which was introduced towards the end of the eighteenth century.

PASSION PLAY, a miracle play representing the incidents of Christ's Passion and Crucifixion. That at Oberammergau, Bavaria, performed every tenth year, is famous.

PASSOVER, the annual Jewish feast which commemorates the "passing over" of the houses of the Israelites during the slaying of the first-born of the Egyptians, as narrated in Exodus xii.

PASSPORT, a document of identity, permitting a person to travel abroad. It is issued by the country to which the person belongs, and countersigned, where necessary, by representatives of those countries in which he wishes to travel.

PATENT, a document issued by a government, conferring certain rights or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

privileges. The word is most commonly used of the protection given to an inventor, by conferring on him the sole right to make and sell, for a period of years, something invented by him.

PATHOLOGY, the science devoted to the study of diseases.

PAWNBROKER, a person licensed to lend money on the security of articles deposited with him. On the repayment of the money and the payment of a fee, within a certain time, the articles are recoverable.

PEACOCK, a genus of game-bird related to the pheasant, and native to India. The male has brilliant plumage and very long tail feathers, which it spreads out like a fan.

PEARLS are hard, globular, iridescent bodies found inside the shell of the pearl oyster and the fresh-water mussel. The Persian Gulf, the Gulf of Manaar (between India and Ceylon), the coasts of W. Australia, and the Pacific Islands are the chief centres of pearl-oyster fisheries.

PEAT, decaying vegetable matter, chiefly mosses, found in boggy districts of the temperate zones. When dried, it is used as fuel and litter.

PENELOPE, the wife of Odysseus. To keep at bay suitors who sought her hand when he had been away many years, she refused to marry any of them till she should have completed a garment for her father-in-law. Every night she unravelled what she had woven by day, and so held off her admirers until Odysseus returned.

PENGUIN, a sea-bird of the southern hemisphere. Its wings are undeveloped and useless for flight, and when on land it sits upright. The largest species, the emperor penguin, is almost 3 ft. long.

PENINSULAR WAR, THE, fought in Spain and Portugal, lasted from August, 1808, till March, 1814. The French, under Soult and other leaders, were opposed to combined British, Spanish and Portuguese forces under Wellington. It resulted in the complete expulsion of the French from the Peninsula.

PENNY.—This copper coin was introduced in 1860. It weighs exactly $\frac{1}{3}$ oz.

PENTATEUCH, the first five books of the Bible—Genesis, Exodus, Leviticus, Numbers and Deuteronomy, containing the Mosaic laws and the history of the Hebrews till they entered Canaan.

PEPPER, the seeds of a tropical shrub, *Piper nigrum.* What is called cayenne or red pepper is the pulverized seed-pods of the capsicum or chilli.

PEPYS'S DIARY, a diary kept by Samuel Pepys, a government official, during the years 1660-1669, in a private cipher of his own. When deciphered in 1825 it threw a great deal of light on the life of Charles II's Court, and on the social manners and customs of the time.

PERFUMES are, with few exceptions, essences and oils obtained from the flowers, leaves, or seeds of plants, by distillation, maceration or pressure.

PERSEPHONE, in Greek mythology, was the daughter of Zeus and Demeter. Pluto carried her off and made her queen of the lower world. Her mother, however, compelled Pluto to let her spend the middle six months of every year on earth.

PERUVIAN BARK.—*See* CINCHONA.

PETER'S PENCE, an annual tax once paid to the Pope. It appears to have originated in England about 720, and to have spread thence to other countries. Its payment ceased at the Reformation.

PETITION OF RIGHT, a measure passed by Parliament in 1627, demanding that no one should be taxed without consent of Parliament, or be imprisoned without reason given; and that civilians should not be tried by martial law, nor have soldiers or sailors billeted on them without their consent. Charles signed it in 1628. In its modern meaning a "petition of right" is a claim presented to the Home Secretary where a party has a grievance of some nature against the Crown.

PETREL, STORMY, or MOTHER CAREY'S CHICKEN, is a very small, black, web-footed seabird, which flies just above the waves in stormy weather.

PETROL, called "essence" in France, and gasolene or "gas" in America, is one of the most volatile liquids derived from petroleum. It evaporates quickly when exposed to the air, and is highly inflammable.

Enormous quantities of petrol are used as fuel for motor vehicles, small stationary engines, and aircraft.

PETROLEUM, or ROCK OIL, is a liquid composed of a number of hydrocarbons, which permeates sandy and porous rock strata in many parts of the world. Its origin may be decayed vegetable matter, of which seaweed may have been a large part. It is tapped by making holes with drilling apparatus and lining them with steel pipes, screwed together. When an oil-bearing stratum is reached, the oil is forced to the surface, if gas is present, under high pressure, and may rise many feet into the air as a "gusher" until got under control; otherwise it has to be baled or pumped. Petroleums vary considerably in their contents, some being rich in the heavier, and others in the lighter elements. From the oil-fields, which in most cases are far inland, the crude petroleum is usually pumped through pipe-lines to refineries on the sea coast. It is there distilled and broken up by heat into com-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ponents of various specific gravities, which are released at different temperatures—petrol, kerosene, lubricating oils, etc. For the transport of these liquids by water, specially constructed vessels, called "tankers," are used. The chief oilfields are situated in the United States, Mexico, Persia, Iraq, Burma, Rumania, the East Indies and the Baku region of south Russia.

PEWTER, an alloy of ninety-five parts tin to five parts copper; used for drinking vessels, plates and ornamental articles.

PHALANX, the massive formation in which the heavy-armed infantry of ancient Greece advanced to battle. It was many ranks deep and designed to burst a way through by sheer weight.

PHARISEES, a religious party of the Jews, condemned by Christ for their interpretation of the law according to the letter rather than the spirit. As a strongly nationalist party, they opposed Him both for His claims and His broader teaching.

PHEASANT, a game-bird, distinguished by its long tail and handsome plumage. The common pheasant may have been introduced into Britain by the Romans, who obtained it from Asia Minor. In recent times the splendid Amherst's pheasant and golden pheasant have been imported from China.

PHILOLOGY is the science of languages. It investigates their origins, relationships and structure.

PHILOSOPHER'S STONE, a substance sought by the alchemists as having the supposed power of converting base metals into precious metals.

PHŒNIX, THE, a mythical bird of ancient Greek legend. It had the form of an eagle. At the end of 500 years it cast itself into flames, out of which a new phœnix appeared.

PHONOGRAPH, the earliest form of "talking machine," invented by Thomas Alva Edison (1847-1931) in 1877. It both recorded and reproduced sounds. (*See* DICTAPHONE.)

PHOSPHORUS, a wax-like solid, one of the elements, which burns with a dazzling flame and has the property of emitting light. It is very poisonous, but in combination with other elements is valuable for heading matches and as manure. In safety-matches, a non-poisonous red form is applied to the box.

PHOTO-ELECTRIC CELL, an electric device which is sensitive to light, and produces an electric effect in accordance with the intensity of the light falling on it. It is an essential element in television and cinematographic "talkies."

PHOTOGRAPHY is the art of impressing permanent images of objects or scenes on sensitized surfaces, by taking advantage of chemical changes produced in certain substances by the action of light. The usual process is to obtain, by means of a camera, a negative image—in which blacks and whites are reversed—on a transparent plate or celluloid film; and to print a positive image—in which there is a reversal to the original values—on another film, usually supported by paper, but, in the case of lantern slides and cinematographic subjects, by a transparent substance, through which light can pass. Harnessed to the telescope and microscope, photography enables the scientist to obtain records of stars which the eye cannot see, and to explore the structure of all forms of solid matter. During the Second World War the extent of damage done in air raids over enemy territory was checked by films taken after the smoke had cleared away. Photography is indispensable to the printer in the production of blocks from which illustrations are printed.

PHRENOLOGY, the so-called science which claims to interpret character and mental capacity from the shape of the head.

PHYLLOXERA, an aphis which attacks the roots and leaves of plants. A species which appeared in France in 1863 did immense damage to grape vines.

PHYSIOLOGY, the science which studies the functions of living organs and organisms, and the processes of growth, decay and reproduction. It regards the living creature from the mechanical or active standpoint rather than from the structural, which is the province of anatomy.

PIANOFORTE, usually called piano for short, was invented in 1708, but not introduced into England till 60 years later. It differed from the clavichord in giving the performer the power of regulating the volume of sound between *piano* (soft) and *forte* (loud), because the force of the hammers striking the strings depended upon the force with which the keys were depressed.

PICTS, a British race which inhabited the British Isles before the Celts, and in the earliest historic times occupied part of Scotland.

PIKE, or JACK, a large freshwater fish, running up to over 50 lb. in weight. It has formidable teeth, which enable it to prey on other fish.

PILCHARD, a seafish allied to the herring, but smaller. Sardines are regarded as being young pilchards. The chief pilchard fishery is that off Devon and Cornwall from August to April.

PILGRIMAGE OF GRACE, an insurrection in the north of England in 1536, provoked by Henry VIII's dissolution of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the monasteries. The insurgents marched to Doncaster, and were dispersed by the royal forces. A second rising in 1537 was equally abortive.

PILGRIM FATHERS, a party made up of 102 men and women, who sailed from England in the *Mayflower* on September 6, 1620, for America, to escape the persecution to which they had been subjected as Nonconformists. Reaching America in December, they founded Plymouth, in Massachusetts, and so began the settlement of what was afterwards called New England. (*See* "MAYFLOWER.")

PILLORY, a framework used as a means of punishment; in which the prisoner was held by neck and hands while standing. It was abolished in England in 1837.

PINE, an important genus of evergreen cone-bearing trees, valuable for their timber, resin and turpentine. The only native British species is the so-called Scotch fir.

PINEAPPLE, the fruit of a tropical American plant, so named because it resembles a pine cone in appearance. In this country pineapples can be grown only in hothouses.

PITCAIRN ISLANDERS. — *See* "BOUNTY," H.M.S.

PLAGUE, the general name for a highly infectious and fatal disease which sweeps through a country, causing great loss of life. The Black Death which ravaged Europe in the fourteenth century, and the Great Plague of London of 1665, were bubonic plagues, which have visited Europe on many other occasions in historical times, and decimated parts of India repeatedly in time of famine. (*See* BLACK DEATH.)

PLANETS, the heavenly bodies which circulate in orbits round the sun. There are nine "major" planets: Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto, reckoning from the sun outwards, and thousands of "minor" planets, or asteroids (*see* ASTEROIDS). The major planets are described under their respective names. Those which lie between the Earth and the sun are called the "inferior planets," and those which lie beyond the Earth the "superior planets." All were probably formed out of a mass of matter detached from the sun by the attraction of a passing star.

PLANTAGENETS, the term commonly restricted to the English kings from Henry II to Richard II, but sometimes extended to include the houses of Lancaster and York, and therefore equivalent to Angevin. The origin of the name is "planta genista," the broom plant, which was the symbol of the Angevins.

PLATINUM, a hard, white metal, one of the elements, valued for its rarity and its great resistance to heat. A large part of the metal mined still comes from the Ural Mountains district of Russia, but important deposits have been discovered recently in Canada, South Africa and Colombia. The annual production is about 300,000 oz.

PLATYPUS.—*See* DUCK-BILL.

PLEIADES, a constellation, named after seven ancient Greek goddesses. Its appearance in the sky during the summer and autumn was formerly associated with stormy weather.

PLUTO, the ancient Greek god, ruler of the lower world, brother of Zeus and son of Chronos (Time). The Romans called him Dis.

PLUTO, PLANET, the outermost of the planets. It was discovered in March, 1930, is thought to be of about the same size as the earth, and is 3,880,000,000 miles from the sun, round which it travels once in 248 of our years.

PLYMOUTH BRETHREN, a religious sect founded at Plymouth in 1830 by John Darby, a clergyman. They do not recognize holy orders, but observe adult baptism and the Lord's Supper.

PNEUMATIC DISPATCH, the transport of telegrams, letters, parcels, etc., in carriers through tubes, by compressed air or suction. It is used in stores, and in and between post offices.

PNEUMATIC TYRES consist of an airtight inner tube, which is inflated with air under high pressure, and a strong outer cover of rubber vulcanized to a fabric backing.

POCKET BATTLESHIPS were constructed by Germany to comply with the article in the Treaty of Versailles that limited the displacement of new armoured ships built by her to 10,000 tons. Many new structural ideas were employed. The idea was to combine speed with heavy gun-power so that the craft would "sink anything that could catch her, and escape anything that could sink her." The Diesel engines were planned to give a maximum speed of about 27 knots; the main armament consisted of six 11-in. and eight 5.9-in. guns. The first of the class was the *Deutschland*, renamed the *Luetzow*, commissioned in 1933; the second the *Admiral Scheer*, launched in the same year; the third the *Admiral Graf Spee*, which took the water in 1934. They were mainly employed as commerce raiders and for attacking convoys. The *Graf Spee*, following the Battle of the River Plate, on December 13, 1939, was scuttled by her crew; her sister ship, the *Admiral Scheer*, capsized in Kiel Harbour following an attack by Royal Air Force Bomber Command on April 9, 1945; and the *Luetzow*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

met her fate in a similar way a week later. The estimated cost of a pocket battleship was about £3,750,000.

POET LAUREATE, the official title of the member of the royal household whose nominal duty it is to compose poems on great occasions. It is conferred by letters-patent, and is practically honorary.

POITIERS, BATTLE OF.—Two great battles were fought at Poitiers, Poiton, France: (1) that of 507 in which Clovis defeated the Visigoths under Alaric; (2) that of 1356, in which the English, under the Black Prince, decisively routed superior French forces.

POLDERS are tracts of land below sea level recovered by the making of earthworks or more substantial structures called polls and pumping the water into dikes. The method is extensively employed in Holland and Belgium. A district in the Netherlands still called Haarlem Lake occupies an area of 70 square miles. New polders formed by cutting off the Zuider Zee by the building of a dam 18 miles long were being made when the Germans invaded Holland in 1940. This method of reclamation, which has been going on for centuries, has enabled the thrifty and hard-working Dutch nearly to double the size of their country, which now has an area of 12,868 square miles. Ijssel Lake, which forms part of the Zuider Zee, has been left to form a huge fresh water reservoir and is already losing something of its saltiness. The decision to reclaim the Zuider Zee was made in 1918, and work was begun two years later. Estimated to cost £80,000,000, it was hoped that the gigantic undertaking would be completed by 1940.

POLECAT, a large British species of the weasel family. (*See* FERRET.)

POLES, GEOGRAPHICAL, the ends of the imaginary axis round which the earth rotates. They have no longitude, but a latitude of 90 degrees. The North Pole was first reached by man (Commander R. Peary, U.S. Navy) on April 5, 1909; and the South Pole (by Capt. Roald Amundsen, the Norwegian explorer) on December 18, 1912. The curvature of the earth is slightly flattened at the poles, owing to the effect of centrifugal force.

POLE STAR, or POLARIS, the brightest star in the constellation of the Little Bear, is almost directly in line with the axis of the earth, and therefore when visible an indication of practically true north.

POLICE, in the modern sense of an organized civilian body for the maintenance of law and order, were unknown in England until 1829, when Sir Robert Peel inaugurated the Metropolitan Police for London (*see* METROPOLITAN POLICE). The system set up by him was adopted later by boroughs and counties, under the control of local committees.

POLYANDRY, the custom of one woman having several husbands, is the reverse of polygamy. It prevails only in parts of India and Central Asia.

POMEGRANATE, the fruit of a small tree grown in warm countries. Inside a tough skin are hundreds of juicy red seeds, each in its separate cell.

POPE, the supreme head on earth of the Roman Catholic Church as Bishop of Rome and the direct successor, through an unbroken line, of St. Peter, the first bishop. Since the eleventh century the election of a pope has been a privilege of the College of Cardinals, in which different countries are represented. Election requires a two-thirds majority of votes. The temporal power of the Pope is now limited by a treaty of 1929 to the City State of the Vatican (area just over 108 acres), within the confines of which he has complete and independent sovereignty.

PORCELAIN, or CHINA, is fine earthenware, thin and usually translucent, made from a mixture of china clay, silica, felspar and oxbone. As it comes from the kiln for the first time it has a dull surface, and is called "biscuit." It is put in the kiln again after being dipped in glaze, which gives it a glossy surface. Decorating may be done before dipping, or after the glaze has hardened, in which case further bakings are needed to set the colours.

PORCUPINE, a quadruped found in Europe, Asia, Africa and America, which has its body covered with sharp quills able to inflict serious wounds. The American species have shorter quills than the others, but they are barbed.

PORPOISE, a marine mammal related to the whales, and 5-6 ft. long. Porpoises go about in "schools," or groups, and a number often follow one another in single file. They feed on fish, which they will pursue far inland up rivers.

PORTCULLIS, a heavy iron grating, running in vertical grooves, at the entrance to a castle or fortress, which could be quickly lowered to prevent access to the gates.

PORTLAND VASE, a very valuable ancient Greek vase of white enamel on dark blue glass, now exhibited in the British Museum. It was broken by a madman in 1845, but very cleverly repaired.

POST-OBIT, a bond given by a person to pay a certain sum after the death of another, from whom he has expectations.

POST OFFICE.—In Britain the Post Office is a State institution with the sole

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

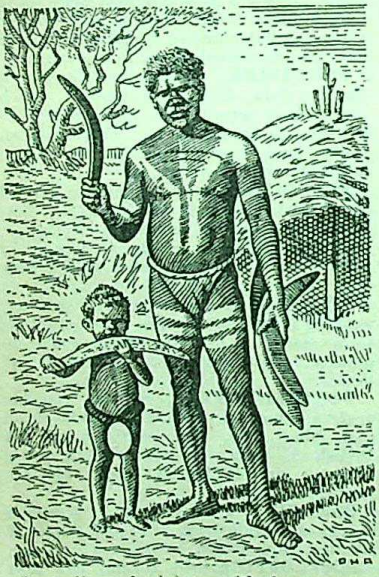
Digitized by Arya Samaj Foundation Chennai and eGangotri

right of carrying letters, and dates from 1657. The service given improved with the condition of the roads, and with the greater speed of mail coaches. In 1840, shortly after the opening of the first public railways, Rowland Hill introduced the penny post system, under which a letter could be sent to any part of the kingdom for a charge of 1d. per ½ oz. Adhesive stamps came into use in 1841; Post Office Savings Banks were established in 1861; in 1870 ½d. postcards were introduced, and in 1881 postal orders. The parcel post came into operation in 1882, and imperial penny postage in 1898.

The Post Office took over all existing telegraphs in 1870 under an Act which gave it the sole right of transmitting telegrams. The same Act enabled it to obtain control of the telephone system of the country, which in 1911 came entirely under Post Office working; as, at a later date, did wireless telegraphy and telephony.

The Post Office issues local taxation licences; pays old-age, widows' and war pensions, and naval and military allowances; the Post Office also issues National Insurance stamps, to a total amount of some hundreds of millions sterling annually.

POTASSIUM, a very light silvery metal, one of the elements. It is little used in the pure state, but its chemical compounds are of great commercial and agricultural value.



Australian aborigines with boomerangs

POTTERY.—*See* EARTHENWARE, PORCELAIN.

POUND STERLING was originally a pound weight of silver of 92.5 per cent purity, subdivided into 240 silver pence. In 1811 the silver standard was abolished in favour of gold, and the words were thereby deprived of their original meaning, and transferred to the gold sovereign. (*See* GOLD STANDARD.)

PRÆTORIAN GUARDS, the household troops of the Roman emperors, established by Augustus in 2 B.C. and suppressed, on account of their political power, by Constantine the Great in A.D. 312.

PRAIRIE DOG, a small burrowing rodent, found in the plains of North America. In many cases its burrow is shared by snakes and a small species of owl.

PREDESTINATION, the doctrine that God fore-ordains all things, including the salvation or perdition of men. It was upheld strongly by Calvin and his followers, though it conflicts both with the redemption of mankind by Christ and with the idea of free-will.

PRESBYTERIANISM is the system of church government by pastors and elders, instead of by bishops as in the Anglican and Roman Catholic Churches. Pastors are elected by the people, but ordained by other pastors as members of a separate ministry. The minister and elders of a congregation form the church "session" or ruling committee. The Established Church of Scotland is Presbyterian.

PRESS-GANG, a body of men under a naval lieutenant, who seized merchant sailors and others and compelled them to enlist in the navy when it was short of men. The system of "pressing" men was abolished after the Napoleonic wars.

PRIAM, king of Troy, who was killed by Pyrrhus after the capture of that city by the Greeks.

PRIME MINISTER, or PREMIER, is the member of the British Parliament entrusted by the sovereign with forming an administration or government, of which he becomes the head. He may belong to either House, and is normally leader of that House, and president at Cabinet meetings. Members of his Cabinet must consult him on matters of great importance belonging to their particular departments. The Premier appoints archbishops, bishops and judges, subject to the sovereign's approval, and puts forward the names of persons upon whom titles or other honours should be conferred.

PRIMITIVE PEOPLES still inhabit remote parts of the world. Probably the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

most primitive are the Australian aborigines, who now number about 470,000. It is believed that about 1,000,000 were living a century and a half ago.

PRIMROSE LEAGUE, a Conservative league formed in 1883 in memory of the Earl of Beaconsfield. The primrose is its emblem.

PRINTING from movable types was first done in Europe about 1450, by Gutenberg, at Mainz, in Germany. In 1811 the "cylinder" machine, which speeded up printing considerably, was introduced; and in 1850 the "rotary" press, which is fed with a web of paper from a reel, running continuously through it. Typesetting machines began to appear in 1822, but did not come into general use till about the end of the century, as Linotype and Monotype.

PRIVATEERS, privately equipped warships granted a licence by the State to prey on enemy shipping in time of war. Privateering was abolished in 1856 by the Declaration of Paris.

PRIVY COUNCIL, originally the sovereign's private council of advisers, was reconstituted in 1679. It now consists of eminent people appointed by the sovereign, who are entitled to be addressed formally as "The Right Honourable." It is presided over by the sovereign or his representative, and matters of various kinds are referred by him to committees chosen from it. The Judicial Committee is the supreme judicial authority of the Empire.

PROMETHEUS, in Greek mythology, a Titan who was chained to a rock in the Caucasus Mountains as a punishment for having stolen fire from heaven and taught its use to men. Every day a vulture gnawed at his liver, which renewed itself at night. He was finally released by Hercules.

PROTECTIONISTS, those who favour the imposition of taxes on imported goods, in order to protect home industries.

PROTESTANTS was the name given originally to the supporters of Luther in his protest against abuses in the Roman Church. The name afterwards was applied generally to members of Churches which separated from the Roman Communion.

PROTEUS, in Greek mythology, an old man who, when seized, could repeatedly change his shape. To anyone who could hold him he would reveal the future.

PROTOPLASM, a jelly-like substance which is the simplest form of living matter and the basis of life.

PROVERBS, BOOK OF, the book of the Old Testament next after the Psalms, is a collection of Hebrew proverbs and discourses, made probably in the third century B.C. Part of it is assumed to have been written by Solomon. Many of the wise sayings which it contains have become standard quotations.

PROVOST, the chief magistrate of a Scottish burgh, corresponding to an English mayor. The Provosts of Edinburgh, Glasgow, Perth, Dundee and Aberdeen are Lord Provosts. The heads of certain cathedrals and colleges are provosts.

PRUSSIC ACID, or HYDROCYANIC ACID, is a very deadly poison, smelling like bitter almonds, in which, and in laurel leaves, it is present. Its compounds, the cyanides, are also extremely poisonous.

PSYCHICAL RESEARCH is the serious study of phenomena such as apparitions, telepathy and other matters, involving the less known faculties of the mind.

PSYCHOLOGY is the scientific study of the working, development and reactions of the human mind, emotions and imagination. Its importance has increased with the realization that the mind has a great influence over the body in ways not formerly suspected.

PTERODACTYL, a large winged reptile, with membranous wings and formidable jaws, which inhabited the earth before the coming of the earliest mammals. It may be regarded as the link between the reptiles and the birds.

PTOMAINES are poisons which develop in canned meat or fish that has not been properly preserved.

PUBLIC PROSECUTOR, a Government official who is directed to institute criminal proceedings in cases where the public interests are seriously affected and a prosecution would not otherwise be made.

PUMA, a large carnivorous animal of the cat family found in the New World. It has a tawny coat, with a black streak along the back, and seldom attacks man.

PUMICE, a light, porous rock ejected from volcanoes. Ground to fine powder, it is used in soaps and for smoothing and polishing metals and other substances.

"PUNCH," the most famous of British humorous periodicals, has been published weekly since 1841.

PURGATORY, a place or state in which, according to the teaching of the Roman Catholic Church, the souls of the faithful are cleansed from sin until fit to enter God's presence.

PURITANS, the religious party in England which, from Tudor times onwards, sought to simplify and purify religion and to enforce austerity of conduct. They formed the backbone of the resistance to Charles I, and attained their greatest power under Cromwell during the Commonwealth.

PYRAMIDS OF EGYPT. These, which number about 70, are the tombs of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ancient Egyptian kings and queens. They are four-sided, and taper to a point, either in planes or in stages. The most famous, and the largest, are the three at Gizeh, near Cairo. The "Great" Pyramid of Cheops, or Khufu, is 753 ft. square, and 480 ft. high. It contains over 7,000,000 tons of massive squared stones, built up in layers, and faced originally with a smooth casing, which has largely disappeared. According to Herodotus it took twenty years to build and 100,000 men were employed.

PYTHON, a genus of large non-poisonous snakes, which kill large prey by pressure. The pythons are restricted to the Old World—India, Eastern Asia and Africa. The largest species are reputed to attain a length of 30 ft.

QUADRAGESIMA, the first Sunday in Lent; that is, the Sunday following Ash Wednesday.

QUADROON, a person of one-quarter negro and three-quarters white blood.

QUADRUMANA, the former name for primates, that is, animals able to grasp with all four feet—the monkeys and lemurs. The word means "four-handed animals."

QUAGGA, an extinct species of zebra, once very numerous in the Cape Colony and Orange Free State, but exterminated by the Boers.

QUAIL, a gamebird related to the partridge, but much smaller. It is seldom seen in Britain, but is netted in great numbers on the north and south coasts of the Mediterranean during the migration seasons.

QUAKERS.—*See* FRIENDS, SOCIETY OF.

QUARTER DAYS are the four days of the year on which rents are paid and business payments made. In England they are March 25 (Lady Day), June 24 (Midsummer Day), September 29 (Michaelmas Day), and December 25 (Christmas Day).

QUARTERMASTER, on a warship or big merchant ship, is a petty officer who takes his turn in steering and looking after the bridge instruments and chart-room. In the army he is an officer (usually lieutenant), who attends to equipment, rations, etc.

QUARTER SESSIONS, minor courts of law held four times a year and presided over by magistrates or justices of the peace.

QUARTO, the size of page obtained by folding a sheet of printing paper thrice. It is shown in catalogues as "4to." (*See* FOLIO.)

QUARTZ is crystallized silica, very hard, and, if quite pure, colourless and transparent. Most sands contain a considerable proportion of pulverized quartz.

QUASSIA, a tropical American tree, the wood of which contains a bitter substance used in medicine as a tonic.

QUEEN ANNE'S BOUNTY, a fund created in the reign of Queen Anne out of dues formerly paid to the Crown. It was administered by a board of governors, who used it to increase the value of small livings, build churches and assist the clergy. On April 1, 1948, it was amalgamated with the Ecclesiastical Commissioners to form the Church Commissioners.

QUICKSANDS, stretches of mixed sand and clay, exposed at low tide, and unable to bear heavy weights.

QUINCE, a fruit related to the pear, which, though not edible in the raw state, makes delicious marmalade and jelly.

QUININE, the bitter extraction of the bark of the cinchona tree (*see* CINCHONA); crystallized as a sulphate it is used to ward off or reduce fevers, especially malaria.

QUINQUAGESIMA, the Sunday next before Ash Wednesday, that is, before the beginning of Lent. The word means "fiftieth (day)," before Easter, though actually Easter Day comes 49 days later.

QUISLING, a term denoting treachery to one's country, derived from Major Vidkun Quisling, Norwegian Defence Minister, 1931-32, who turned traitor when Norway was invaded by the Germans in April, 1940. There were many other Quislings during the Second World War in German-occupied Europe.

QUORUM, the minimum number required to render a meeting valid.

RABBIT.—In this country the rabbit is valued for its fur and its flesh. But in New Zealand, and still more in Australia, into which countries it was introduced from England, it has found conditions so favourable that it has multiplied enormously and is a serious pest to farmers and stockmen.

RACK, an old instrument of torture, with rollers, on which were wound cords attached to the hands and feet of the victim. It was used chiefly to extort confessions.

RACOON, a small carnivorous animal, found in the New World. It is related to the bears, and has a long tail, ringed with black and white. It lives in trees and moves about at night.

RADICALS, the name given formerly to Left-wing extremists of the Liberal party.

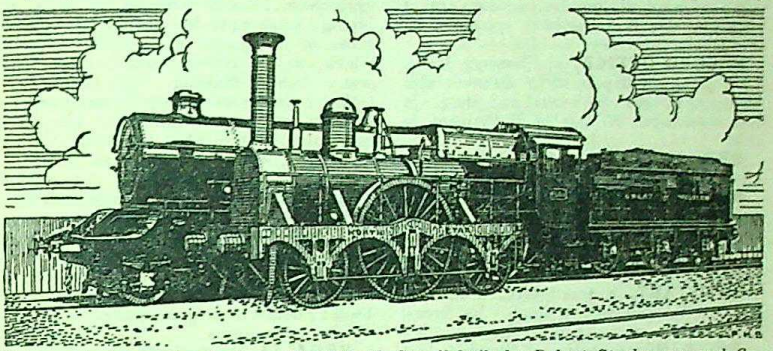
RADIUM, a metallic element derived from pitchblende, discovered in 1898 by Madame Curie, the famous French scientist. It has the remarkable properties of emitting three kinds of rays continuously, without perceptible diminution of bulk. These rays are respectively Beta rays, Gamma rays and X-rays. It is now used for the treatment of certain skin diseases and cancer.

RAILWAYS, in the sense of metal tracks for vehicles to run on, are about

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

200 years old. They were first used for hauling coals from mines to river wharves. In the beginning, cast-iron plates, with flanged edges to guide the wheels, were employed. In 1789 William Jessop had a track with "edge" rails, which required the flange to be on the wheels; and this was the first railway in the modern acceptance of the term. Steam was used first for haulage on railways by Richard Trevithick in 1804. The Stockton and Darlington Railway, opened in 1825, was the first public steam railway; and the Liverpool-Manchester Railway, opened in 1830, the first on which steam only was used. Most of the railways in Great Britain were amalgamated into four groups, the Southern, the Great Western, the London, Midland and Scottish, and the London and North Eastern, by the passing of the Railways Act (1921). In 1948, when they were nationalized, they became British Railways.



Progress in locomotive design. The "North Star," built by Robert Stephenson and Co. in 1837, compared with one of the "King" class, hauling expresses in postwar years

RAIN is atmospheric moisture, condensed, probably round a nucleus of dust, into drops too large to remain suspended in the air. Rainfall in different areas is measured by means of rain gauges. It varies from practically nothing in certain arid districts to over 460 in. in a year (average) in part of Assam. The greatest recorded fall in Britain is one of 9½ in. in a day, and of about 250 in. in a year.

RANELAGH, the name formerly given to a famous polo, golf and lawn tennis club near Barnes Common, London, S.W. The title is taken from the Ranelagh Gardens, Chelsea, a former great resort of Londoners, which were closed in 1804.

RAT.—Two species of this very destructive rodent are found in Britain: the older black rat, which appears to have been imported by ships from China, and the much more common brown rat, which arrived later, and is probably a native of Eastern Asia. In Britain the brown has nearly exterminated the black species.

RATIONALISM is a system of belief founded on pure reason. It subordinates revealed religion to what the reason is able to accept.

RATTLESNAKE, a poisonous American snake which, when alarmed, vibrates horny rings on its tail. The rings are ingeniously interlocked. It may reach a length of up to eight feet.

RAY, a flat-fish allied to the sharks and skates. Some tropical species are able to give electric shocks and others attain enormous dimensions. *(See* DEVIL-FISH.)

RAYON, or ARTIFICIAL SILK, is made by squeezing cellulose made from wood or other vegetable fibre through very fine nozzles and subjecting the threads thus formed to treatment which hardens them. Since the First World War the manufacture of rayon has assumed great importance, and the artificial has replaced the natural fibre very extensively.

REAPING MACHINE, an apparatus which substitutes mechanical power for the sickle and scythe. The first patented implement, which was invented by the Rev. P. Bell, a Presbyterian minister, in 1831, may be seen in the Science Museum, S. Kensington, London. It revolutionized the gathering of fodder and cereal crops and has since been developed into forms which bind, or even thresh and winnow, grain as fast as it is reaped. The fundamental item of the machine is a bar carrying a large number of sharp triangular blades, which is vibrated to and fro many times a second by gearing, through sharp, fixed guides. The bar travels parallel to, and a few inches away from, the ground, and cuts a swathe as wide as itself. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

self-binder, used for corn, delivers the reaped grain to an apparatus which binds it into sheaves. The reaper-thresher passes the reaped material to a threshing machine.

REBECCA RIOTS took place in Wales in 1843. They were directed against the system of tolls on roads. Bands of men, disguised as women, wrecked the toll gates. Their activities had a great influence in causing the abolition of tolls.

RECORDER, the salaried magistrate who presides at quarter sessions in a borough. He is a barrister appointed by the Home Secretary.

RECORD OFFICE, in Chancery Lane, London, is the depository of documents of historical interest, both legal and State. It was established by Act of Parliament in 1838.

RED CROSS.—*See* GENEVA CONVENTION.

REDPOLL, a small finch which visits Britain in the summer, and migrates to southern countries in the winter. It gets its name from the crimson crown of its head.

REDSTART, a small bird, a summer visitant to the British Isles. Its breast and tail are of rusty red colour.

REDWING, a species of thrush, which comes to Britain from more northerly latitudes during the winter. It gets its name from its orange-red wings. When April comes, it migrates northwards again.

REDWOOD, the popular name of the Sequoia, a genus of evergreen and coniferous Californian trees. The *S. gigantea* is one of the largest of all trees, attaining a height of over 400 ft. In England it is known as the Wellingtonia. It is distinguished by its thick, corrugated bark, and the sudden swell of the trunk near ground level. It yields a valuable timber.

REFERENDUM, a system of voting under which a matter of national importance is submitted directly to the votes of the electorate of the country. Voters are entitled to vote only for or against the question submitted.

REFORMATION, a great religious revolution against the power of the Roman Church, inaugurated by Martin Luther in the sixteenth century. It affected N. Europe and England and resulted in the severance of the English Church from Rome, the suppression of the monasteries and the rise of various Protestant Churches.

REFORM BILLS, THE, of 1832, 1867 and 1885 respectively, extended the parliamentary franchise and redistributed the seats in the House of Commons.

REFRIGERATION.—The production of low temperatures artificially is based on the fact that, when a liquid boils or turns into a gaseous state, it absorbs heat from anything with which it makes contact. If ammonia gas or carbonic acid gas be greatly compressed and at the same time cooled, it becomes a liquid which "boils" at a temperature far below the freezing point of water. The ordinary refrigerating plant therefore consists of a compressing apparatus for liquefying one of these gases, and an evaporator in which the liquid is allowed to revert to its gaseous form. The evaporator usually consists of coils of piping, submerged in a tank filled with brine or a solution of calcium chloride, which can be cooled much further than water without freezing.

As it vaporizes in the evaporator the liquefied gas extracts heat from the coils, and these in turn chill the brine. After expanding, the gas returns to the compressor, to be liquefied again. The chilled brine is pumped through pipes on the ceiling and walls of the chamber to be refrigerated, and after traversing these and picking up some heat, is delivered back into the tank for re-cooling. By means of regulating valves the temperature in the cooled chambers may be controlled within very narrow limits.

REGALIA, the insignia or emblems of royalty, kept in the Tower of London. They include crowns and other articles used at a coronation, and the Crown Jewels.

REGIUS PROFESSOR is the title given at Oxford and Cambridge universities to a professor appointed to a "chair" dating back to the time of Henry VIII. In Scotland the term signifies the holder of a professorship created by the Crown.

REICHSTAG, the parliament of the German Republic, to which members were returned by the votes of the adult voters, male and female, of the whole nation.

REICHSWEHR, the former German regular army.

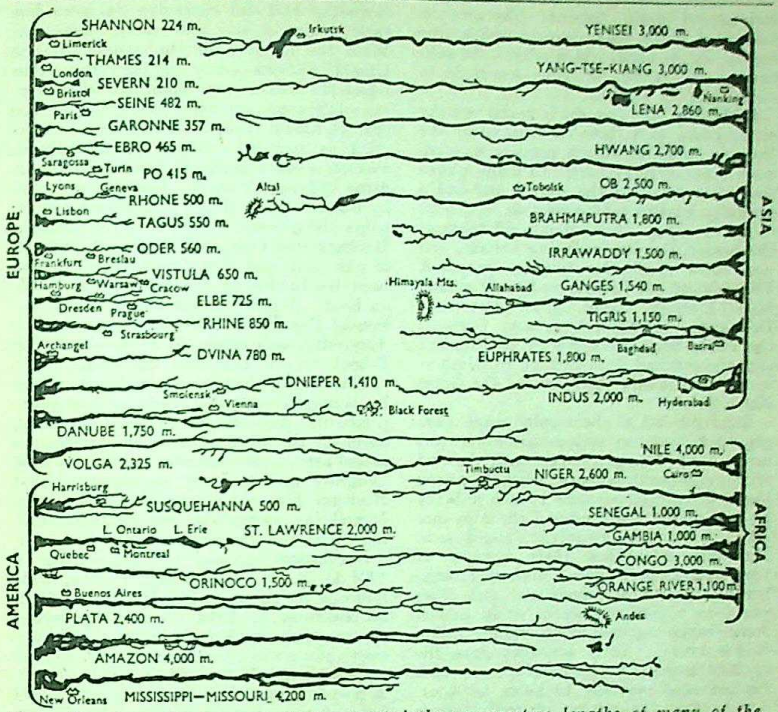
REIGN OF TERROR, the period of the French Revolution, lasting from May, 1793, to July, 1794, during which the Jacobins, under Robespierre, were in power. It was marked by the wholesale execution of persons suspected of loyalty to the monarchy. (*See* JACOBINS.)

RELATIVITY. — *See* EINSTEIN'S THEORY OF SPACE.

RELIGIONS.—The religions of the world may be divided into two great classes: the Christian, which has about 700,000,000 nominal adherents; and the non-Christian, with 1,100,000,000 adherents. The Christians fall under three main headings: the Roman Catholics, the Greek Church and the Protestant Churches. The chief non-Christian religions are, in order of number of adherents,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



From the above diagram can be appreciated the comparative lengths of many of the world's greatest rivers, lengths being drawn approximately to scale. Note, for example, the insignificant appearance of Britain's River Thames in the top left-hand corner!

Confucianism, Hinduism, Mohammedanism and Buddhism.

RENAISSANCE, THE, otherwise called the Revival of Learning, followed the capture of Constantinople in 1453 by the Turks and the scattering of the Byzantine scholars. It affected the whole of Europe, including England, and stimulated interest in classical culture and science. Also, it was one of the factors which led to the exploration of countries outside Europe.

REPRESENTATIVE PEERS are peers of Scotland and Ireland who represent their countries in the House of Lords. Unlike those of England, they are not hereditary, but elected by their peers.

REPTILES, the great order of vertebrate, or backboned, animals which appeared on the earth before the birds and mammals, both of which may have been derived from them. They differ from mammals in being reproduced from eggs, and from both them and birds in having a hard, scaly skin, devoid of hairs or feathers. Their legs are short, or, in the case of the snakes, absent or undeveloped.

REREDOS, the ornamented wall or screen immediately behind the altar of a church. In some cases, as at New College, Oxford, it has many niches, containing statues of saints.

RHINOCEROS, a genus of large, thick-skinned, hoofed animals, found in Africa and Asia. It is taller than the hippopotamus, but has a shorter body. There are three Asiatic and two African species, some of which have been almost exterminated. All have horns on their noses, some two and some one.

RICE, the grain of a species of grass cultivated in hot countries, is one of the most important of cereals, as it forms the chief food of hundreds of millions of Asiatics.

RIVERS.—The five longest rivers of the world are the Mississippi and Missouri (4,200 miles), U.S.A.; Amazon (4,000 miles), S. America; Nile (4,000 miles), Africa; Yangtse-Kiang (3,000), China;

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and Yenisei (3,000), Siberia. The greatest volume of fresh water is delivered to the sea by the Amazon, which affects the saltness of the ocean for some hundreds of miles from its mouth.

ROADS.—The first roads really worthy of the name were those constructed by the Romans from the fourth century B.C. onwards (*see* APPIAN WAY). In many places they were paved on the surface and had a carefully constructed foundation of layers of stone. They extended into all parts of the Roman Empire, including Britain, and were used chiefly for military purposes. The chief of the Roman roads in England were Watling Street, from Dover to Uriconium, in Shropshire, and Chester; the Fosse Way, from Exeter to Lincoln; and one running from London to Glasgow along what is now the course of the Great North Road.

After the fall of the empire roads were neglected, and no serious attention was given to their improvement until the end of the eighteenth century, when Napoleon began the great system of French military roads, some of which crossed the Alps into Italy. Soon afterwards, Telford and Macadam established their systems of road-making in Britain, Telford concentrating on a firm foundation, and Macadam on a good surface of small broken stone, keyed together by the rolling action of the traffic. Their activities gave the country many fine highroads, on which coaches could average 10 miles an hour. Later came the paving of town streets with stone blocks (setts) and wooden blocks set in bitumen on a firm foundation. These surfacings have in recent years been replaced largely by asphalt, or by stone mixed with bituminous compositions which resist water.

Germany modernized many of her roads and built new ones—for fast motor traffic, previous to the Second World War. The construction of the Burma Road from Chungking (China) to Lashio (Burma) was a considerable achievement, as was the Alaskan Highway from Fairbanks (Alaska) to Edmonton (Canada), a distance of about 1,600 miles.

ROCKETS for offensive purposes were first used against England in 1944 and were regarded as indications of the break-up of Germany, although they were heralded in the Reich as the most powerful of Hitler's secret weapons. Their intention was to make total war against the civilian population and thus destroy morale. Falling from a great height and at a speed faster than sound, so that the noise of their descent was not heard until the explosion had taken place, no air-raid warning was possible. They caused many casualties and did extensive damage, but their main object was never achieved. With the advance of the armies of the United Nations many of the sites from which the rockets were launched were overrun, following extensive bombing on the part of Allied airmen. The fuel was supplied by two big tanks; the mechanism was of a most intricate kind. Guns for firing V3 rocket shells, heavily protected by concrete 18 ft. thick and placed 400 ft. below the ground, were discovered between Boulogne and Calais. Had they been used it was estimated that London would have been bombarded at the rate of 600 shells an hour. A rocket-power bomb, the invention of Captain E. Terrell, of the British Admiralty, was employed to penetrate the E-boat pens at Ijmuiden, Holland.

The development of the military rocket by Germany was the result of many experiments undertaken in that country, although the Chinese used this means to propel arrows ten centuries earlier. In 1806 Congreve rockets were employed against Boulogne during the struggle with Napoleon I, and they were used for throwing life-lines from the shore to a distressed vessel.

Suggestions of rocket flight, made in 1903 by K. E. Ziolkowsky, Russia, were followed by those of Dr. R. H. Goddard, an American, in 1919. A rocket-propelled car was built by Fritz von Opel, the German automobile manufacturer, in 1928, and attained a speed of over 100 miles an hour. A postal service by rocket was established between two places near Graz, Austria, by Friedrich Schmiedl three years later, and a similar service was begun over the Harz Mountains, Germany.

ROOD SCREEN, a screen, usually of carved wood, between the chancel and the rest of a church. So called after a crucifix, or "rood," mounted over the centre of it.

RORQUAL, or FIN-WHALE, a very large whale, attaining a length of up to 85 ft., hunted for its blubber and considerable oil.

ROSES, WARS OF THE, is the name given to the struggle between the Yorkist and Lancastrian factions which lasted from the First Battle of St. Albans, in 1455, till the Battle of Bosworth, in 1485, in which the Lancastrians, under Henry Tudor (Henry VII), were the victors. By marrying Elizabeth of York, Henry removed any reason for further fighting.

ROSETTA STONE, a basalt slab discovered in 1799 near Rosetta, in Egypt, which provided a key for the reading of Egyptian hieroglyphics. It has on it inscriptions in Greek and Egyptian characters. Now in the British Museum.

ROTHAMSTED INSTITUTE, Harpenden, Hertfordshire, is the great British

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

experimental station for agricultural research. The land was bequeathed to the nation by the late Sir John Bennet Lawes, who began experiments there in 1843.

ROUNDHEADS, the contemptuous nickname given by the Royalists during the Civil War to the close-cropped Parliamentarian soldiers of Cromwell.

ROYAL ACADEMY OF ARTS, THE, commonly called simply "The Academy," was founded in 1768 by George III. Its headquarters is Burlington House, Piccadilly. It has about 50 members (R.A.), and 30 associates (A.R.A.), and holds an annual exhibition of painting and sculpture from May to August.

ROYAL ACADEMY OF MUSIC, THE, was established in 1822, to give complete training in all branches of music. Fellows and Associates of the Academy are entitled respectively to the initials F.R.A.M. and A.R.A.M. after their names. Address: York Gate, Marylebone Road, N.W.1. It must not be confused with the Royal College of Music, South Kensington, founded in 1883, which is chiefly an institute for examining and giving diplomas.

ROYAL EXCHANGE, THE, in the City of London, was opened in 1844 as a meeting-place for merchants. It is the third building having the same purpose built on the site. The interior is decorated with very fine frescoes by modern artists.

ROYAL INSTITUTION, THE, in Albemarle Street, London, was opened in 1799 to help the teaching of science.

ROYAL SOCIETY, THE, domiciled at Burlington House, London, and the leading scientific association of the country, was given a Royal Charter by Charles II in 1662. Papers are read frequently before it, and grants are made to help research. To have the right to put F.R.S. after one's name is a coveted honour. Fifteen fellows are elected yearly.

RUBBER.—*See* INDIA-RUBBER.

RUBICON, a small river in Italy, flowing into the Adriatic, which in old Roman times was the boundary between Italy proper and the provinces. By crossing it in 49 B.C. with an army at his back and entering Italy, Julius Cæsar practically declared war on Rome. Hence the phrase "to cross the Rubicon" means to take what may prove to be a fateful step.

RUBY, a red variety of oxide of aluminium which differs from sapphire only in colour. Large stones of good colour are more valuable than diamonds of equal size.

"RULE, BRITANNIA!" was written as part of a play in 1740, but its exact authorship is uncertain. The stirring tune accompanying the words was composed by Dr. T. A. Arne (1710-1778).

RUM is a spirit distilled from sugar molasses. The best comes from Jamaica.

RUNES, the characters of the Scandinavian alphabet used in the third and fourth centuries A.D. They are found on old Norse monuments.

RUPEE, a silver coin used as the unit of currency in India and Pakistan.

RYE, a cereal related to barley, is grown chiefly in Northern Europe and Russia. The bread made from it is a good deal darker than wheaten bread.

SABLE, a species of marten, found in Siberian forests, the rich brown fur of which is greatly valued.

SABOTAGE in peace-time means wilful damage done by way of protest against a real or fancied grievance. In war it is the hampering of the enemy by civilians. During the Second World War many citizens of German-occupied countries helped their deliverance by wrecking trains, blowing up bridges, and so on.

SACCHARIN, an extremely sweet white substance derived from coal tar.

SACRAMENT, a solemn rite of the Church, regarded as a symbol or means of Divine grace. The Protestant Churches recognize two sacraments only: Baptism and the Lord's Supper. The Roman Catholic Church recognizes five more: confirmation, ordination, penance, marriage and extreme unction.

SADDUCEES, the sect or party of the Jews at the time of Christ who respected only the written law, and denied the resurrection and the existence of a spiritual world.

SAFETY-LAMP, an oil lamp suitable for use in coal mines liable to escapes of inflammable gas. The flame is surrounded by wire gauze instead of glass. The latter admits air, but prevents gas outside the lamp being ignited. Sir Humphry Davy and George Stephenson both invented it at the same time (about 1818). It has a second very important purpose—that of detecting the presence of gas, which, when the flame is turned down, will burn round it. While in use the lamp is locked, and cannot be opened by the user.

ST. PAUL'S CATHEDRAL, London, the fourth church erected on the site, was constructed by Sir Christopher Wren during the years 1675-1710. The cost of the work, about a million pounds, was defrayed by taxes on coal and wine. From the street level to the top of the cross the height is 365 ft.; the overall length is 515 ft., and the width across the transept 250 ft. Between the interior dome and the exterior dome is a great brickwork cone, which carries the "lantern." The crypt, extending the whole length of the church, contains the tombs of Nelson, Wellington and many other great men. Since the First

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

World War much work has been done on the foundations and main piers of the building, which were showing serious signs of weakness, and an enormous chain of steel bars has been substituted for the iron chain with which Wren encircled the base of the dome.

ST. PETER'S, ROME, is the greatest cathedral in the world. It replaced an older church built by Constantine the Great in 306 on the reputed site of the martyrdom of St. Peter. Begun in 1506, it was not completed till 100 years later. It is far larger than St. Paul's, measuring 615 by 450 ft. inside, and the cross on the dome is over 400 ft. above the street.

SALAMANDER, an amphibious, lizard-like creature, which in ancient days was believed to be able to live in fire.

SALMON. This large fish is prized for its pink flesh and for the good sport which it gives. It ascends rivers in the autumn to spawn, and returns in the spring to the sea, where it feeds till it is in good condition again. There are many species in different parts of the world. Vast numbers are caught on the west coast of the United States and British Columbia and canned.

SALT is a chemical combination of the elements chlorine and sodium, and to the chemist is known as sodium chloride (NaCl.). It is the most important condiment, and essential for the preservation of meat exposed to the air.

By far the greatest quantity of salt existing is contained in the waters of the oceans. This has been estimated at about 5,000,000 cubic miles. In Brittany, California, India and many other countries salt is obtained by evaporating sea-water in the sun. In many parts of the world salt exists in great bulk on the sites of ancient lakes, the water of which has evaporated. And again, as in Cheshire, and Wieliczka, in Galicia, vast deposits of "rock" salt exist underground, these being the beds of ancient lakes which in the course of ages have been overlaid by more recent strata. They are either mined "dry," like coal and other minerals, as is done at Wieliczka; or flooded with water, dissolved as brine, pumped to the surface, and evaporated to extract the salt, the procedure followed in Cheshire.

Apart from its uses as a condiment and preservative, salt is important as the source of its elements, sodium and chlorine.

SALVAGE, in the nautical sense, is money paid by the owners of a ship or cargo for services rendered in saving the same, by towing a disabled or abandoned ship into port, raising a sunken vessel, or recovering its contents. One of the largest salvage jobs ever undertaken was the raising of the *Normandie* (83,000 tons) after she had been burnt and capsized at New York in 1942.

SALVATION ARMY, THE. This great movement for evangelizing and assisting the rougher and poorer elements of society was founded, as regards its present name and semi-military organization, in 1879, by the Rev William Booth (1829-1912), who remained its "General" and head till his death. The opposition which its novel methods at first aroused was gradually overcome.

SAND is grains of rocks of different kinds, produced mainly by weathering and the action of moving water. The purest quartz sands are white, and valuable for glass-making and polishing. They re sold as "silver" sand.

SANDPIPER, a long-legged wading bird of the seashore, which utters shrill piping cry. Besides the Common Sandpiper there are other species, such as the Curlew and Redshank.

SAN FRANCISCO CONFERENCE, opened in April, 1945, was called to discuss means for setting up an international organization to maintain peace and security. It was attended by 1,200 delegates representing 50 nations, all of whom had declared war on Germany. Eighteen countries were unrepresented. The conference was opened by President Truman, of the United States.

SANHEDRIN, the supreme council of the Jews in olden times. It had 71 members, and was both the Jewish parliament and chief court of law.

SANS-CULOTTES, the name given to the lower orders of France during the Revolution. The words mean "without breeches," as these folk wore long trousers instead of the aristocratic knee-breeches

SANSKRIT, the old literary language of India.

SAPPHIRE, a precious stone, a blue variety of corundum. The best sapphires come from Siam.

SARACENS, a general term used in the Middle Ages for the Mohammedan Arabs who held Palestine, invaded North Africa and took Constantinople.

SATELLITE, a heavenly body revolving round a larger body. The moons of the planets are their satellites, and the planets are satelhtes of the sun.

SATINWOOD, a beautiful wood, used in cabinet-work and for furniture. It comes chiefly from India and the West Indies.

SATURDAY, the seventh and last day of the week, is named after the Roman god Saturn.

SATURN, in Roman mythology, the god of agriculture and husbandry. His festival was the yearly Saturnalia.

SATURN, PLANET, the second largest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the planets, is sixth in distance from the sun. Its diameter is nine times that of the earth, and it revolves round the sun in 29½ of our years at an average distance of 886,000,000 miles. In addition to nine moons, it has a unique feature in its three flat, circular rings, which may be composed of the fragments of disrupted satellites.

SATYRS, in classical mythology, semi-divine beings with the legs and horns of a goat, much given to wine, sensual pleasures and mischievous pranks.

SAXONS, a German or Teutonic race which occupied the N. coasts of Germany in the second and third centuries. Large numbers of them invaded Britain in the fifth and sixth centuries; and to them we owe the names of counties ending in "sex." Another branch settled in what is now Saxony, in modern Germany.

SAXOPHONE, a brass musical instrument, with a reed mouthpiece, keys covering a number of holes in the tube, and a turned-up bell mouth.

SCHNEIDER TROPHY, a valuable silver statuette presented by the late M. Jacques Schneider to be competed for by seaplanes of all nations over a course of not less than 150 sea-miles. It was won outright by Britain in 1931, with a speed of 340 miles an hour, which secured a third successive victory.

SCHOONER, a sailing ship with two or three masts, all fore-and-aft rigged. A "top-sail" schooner carries a square top-sail on the foremast.

SCIENCE MUSEUM, South Kensington, London, contains splendid exhibits of industrial and mechanical engineering, of machines used for land and air transport, and of scientific instruments and inventions.

SCORCHED EARTH. — The burning, smashing or removal of everything likely to be of service to the enemy. It was widely adopted by China, Russia and Germany in the Second World War. The practice dates from the campaign of Darius, King of Persia, against the Scythians about 512 B.C., and was revived by General Pai Tsung-hsi against the Japanese in 1937.

SCORPION, a creature related to the spider, which has a venomous sting in its tail. It is found only in hot countries.

SCYLLA, a monster of ancient Greek legend which lived on a rock in the Straits of Messina, near the whirlpool Charybdis. Mariners endeavouring to escape Charybdis were in danger of being seized by the six-headed Scylla.

SEA ELEPHANT, the largest of the seals. The male, which may measure up to 20 ft., has a long nose, suggestive of a trunk, which gives the species its name.

SEA-HORSE, a curious little fish with a horse-like head and a long prehensile tail.

SEALS, carnivorous marine mammals, with their limbs developed into paddles or flippers. There are two classes: (1) the eared or fur seals, and (2) the "earless," which have no external ear, and are hunted only for their blubber. The seals seen round British coasts belong to the second class.

SEAPLANE, a heavier-than-air aircraft fitted with floats for taking off and landing on water.

SECRETARY BIRD, a long-legged African bird of prey, related to the vultures, and named after a head-plume which suggests a quill pen. It is carefully protected for its useful services in killing venomous snakes.

SECULARISM, a tendency of thought which rejects religious dogmas and lays greatest stress on improving the material conditions of life. It regards religious beliefs as a handicap on human progress.

SEDGEMOOR, BATTLE OF, the last battle fought on English soil, took place in July, 1685, between Taunton and Bridgwater, Somersetshire. Rebel forces, headed by the Duke of Monmouth, were defeated; the Duke was captured and executed.

SEISMOMETER, an apparatus for measuring and recording earthquake shocks. It includes some form of very sensitive pendulum, three pendulums being used to record movements in all directions.

SENATE, originally the name of the state council of ancient Rome. During the republic the Senate had no legislative powers; but under the emperors it was allowed to make laws, though it gradually became quite subservient to the later emperors.

In modern times the word signifies the Upper House or Chamber of a Parliament, as in the U.S.A., Canada, France, Italy, Eire, etc.; or the governing body of a university.

SEPOY, a native infantry soldier of the Indian Army.

SEPTEMBER, the ninth month of the calendar year, originally the seventh of the Julian year.

SEPTUAGESIMA, the third Sunday before Lent.

SEPTUAGINT.—*See* BIBLE.

SETTLEMENT, ACT OF, passed in 1701, enacted that Anne, the youngest daughter of James II, should succeed William III, and the crown pass after her death to Sophia of Hanover, James I's granddaughter, and to her children. It thus established the Hanoverian line of English monarchs from whom the present House of Windsor is directly descended.

SEVEN CHAMPIONS OF CHRISTENDOM, THE, were: St. George of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

England, St. Andrew of Scotland, St. David of Wales, St. Patrick of Ireland, St. Denis of France, St. James of Spain and St. Anthony of Italy.

SEVEN SAGES OF GREECE, THE, also called the Seven Wise Men, were ancient Greek philosophers renowned for wise sayings which became proverbial. They were: Solon of Athens, Thales of Miletus, Periander of Corinth, Pittacus of Mitylene, Cleobulus of Lindus, Bias of Priene and Chilon of Sparta.

SEVEN WONDERS OF THE WORLD, THE, as reckoned by the ancients were: (1) the pyramids of Egypt; (2) the terraced gardens constructed by Queen Semiramis at Babylon; (3) the Colossus of the island of Rhodes; (4) the Pharos, or Lighthouse, built by Ptolemy II in the third century B.C. on a small island of the same name at Alexandria, Egypt, and said to have had a height of 400-500 ft.; (5) the statue of Zeus at Olympia, the work of the great sculptor Phidias (490-432 B.C.), reputed to have been 40 ft. high and covered with gold; (6) the Temple of Artemis, or Diana, at Ephesus, which had 127 marble columns 60 ft. high; (7) the Mausoleum built at Halicarnassus, Asia Minor, in 353 B.C. by Queen Artemisia as a tomb for her husband Mausolus, King of Caria. Only the pyramids have survived.

SEVEN YEARS' WAR (1756-1763) is the name given to the struggle between Austria and France on the one side, and Germany, assisted by Britain, on the other, for the possession of Silesia. It ended with the Peace of Paris in 1763. While it lasted, England gained possession of Canada, by the capture of Quebec (in 1759), and established herself firmly in India by the victory she won at Plassey.

SEWING MACHINES. — The first really successful machine was the chain-stitch machine patented in England in 1841. The lock-stitch machine of Elias Howe, an American, appeared in 1846.

SEXAGESIMA, the second Sunday before Lent.

SEXTANT, an instrument used for measuring the angle of the sun, or other heavenly body, above the horizon. Navigators employ it at sea for taking observations which enable them to reckon latitude.

SHAD, a sea fish of the herring family, but considerably larger, attaining a length of up to 20 inches. It ascends rivers to spawn.

SHAGREEN, the rough skin of the dogfish, ray or shark, used as leather and for polishing.

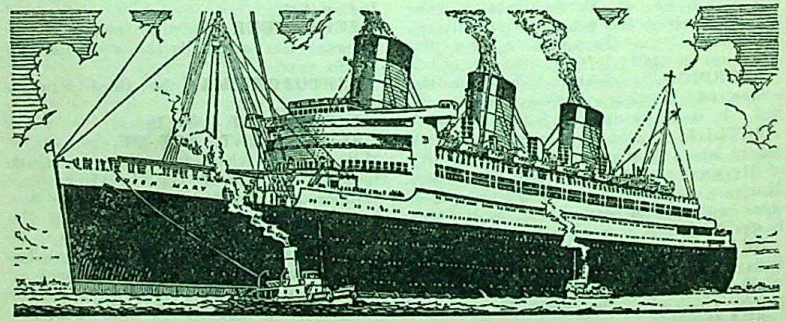
SHAMROCK, a species of clover, the leaf of which is the national emblem of Ireland.

SHARK, the name of a family of fishes, ranging in size from the dogfish to species over 50 ft. long, found in tropical waters. They are distinguished by the overhanging top jaw, and their formidable teeth. Some of the larger species attack man, others do not; all are carnivorous.

SHELLAC, a resin obtained from trees inhabited by an insect which punctures the bark. After being purified it is sold to manufacturers of transparent varnishes.

SHERIFF, the chief crown officer in an English or Welsh county. The word is a contraction of "shire-reeve." In Scotland sheriff signifies a county court judge. The City of London has two sheriffs, elected annually on Midsummer Day.

SHIPS. — The earliest pictorial representation of a ship—an Egyptian vessel—is at least 6,300 years old, and so predates the traditional period of Noah's Ark, the first floating structure of which there is any detailed record. Early ships were propelled by oars as well as sails, and oars did not go entirely out of use till the eighteenth century (*see* GALLEY). The ship in which Columbus discovered the New



One of the world's great ships: the British Cunard-White Star liner "Queen Mary"

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Roots of Numbers
Digitized by Arya Samaj Foundation Chennai and eGangotri

World—the *Santa Maria*—displaced only about 250 tons of water. Steam was first applied to ships about 1786, but it did not enable them to eclipse sailing ships in the matter of speed for 70 years or so. The famous sailing tea-clippers of the 'fifties and 'sixties of the nineteenth century made remarkable records. The first crossing of the Atlantic by a steamship stands to the credit of the *Savannah*, in 1818. From 1850 onwards sail definitely began to give way to steam. Iron commenced to replace wood for hull construction in 1839, and steel to replace iron in 1876. The appearance of the marine steam turbine in 1894 led to a considerable increase in the speed of fast vessels, including practically all warships. The *Vulcanus*, built in 1910, was the first seagoing ship equipped with internal-combustion engines. H.M.S. *Warrior* (9,210 tons), Britain's first ironclad, launched in 1860, was used as a parent ship for coastal craft during the Second World War.

SHODDY, woollen cloth woven from yarns spun out of old woollen fabrics disintegrated for the purpose.

SHORT PARLIAMENT, the Parliament summoned by Charles I in 1640 and dissolved three weeks later, on account of its opposition to the king's demands for money.

SHRIKE, a bird allied to the sparrow, also called the butcher-bird. It feeds on smaller birds, beetles, etc. There are two British species, the red-backed shrike, and the rarer great grey shrike.

SHROVE TUESDAY, the day before Ash Wednesday; so named because in olden times penitents were shriven of their sins on that day.

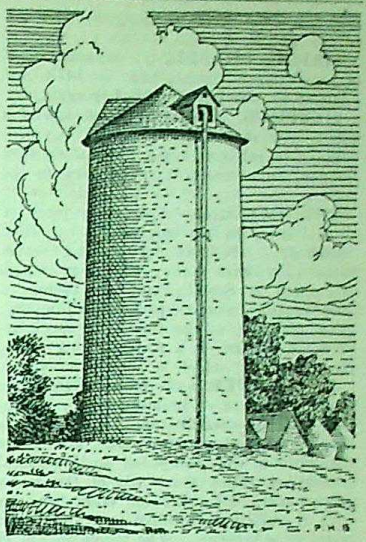
SIBYL, a prophetess of ancient classical times. The Cumæan Sibyl offered King Tarquin of Rome nine books of prophecies. When refused her price, she burned three, and then three more; and sold the remaining three for what she had asked at first. These were kept in the Temple of Jupiter, and consulted in national emergencies until the destruction of the temple in 82 B.C.

SIEGFRIED LINE. — *See* MAGINOT LINE.

SIKHS, a Hindu sect inhabiting the Punjab, in India, and Pakistan. Soldiers enlisted from among them form some of the finest units of the native troops.

SILENCE, TOWERS OF, structures in which the Parsees of India expose their dead, to be devoured by vultures.

SILK is the beautiful yellow, glossy fibre spun by the silkworm, the caterpillar of a moth bred in China, Japan, S. France and other countries, to envelop itself in when it forms its cocoon. It consists of two threads, stuck together by an adhesive. The cocoons are placed in warm water, and the silk is wound off as skeins, which are exported to spinning mills.



Silo for storing winter feed for cattle

SILO, a cylindrical structure of wood, stone, brick or concrete for the economical storage of green crops—known as silage or ensilage—for the use of farm stock.

SILVER, a white precious metal, one of the elements. Alloyed with a little copper, it is used extensively for coinage. Its freedom from corrosion, and the readiness with which it takes a high polish, have made it a favourite metal for spoons and other table-ware ornaments and decoration, and for the electro-plating of base metals. Nearly one-third of the world's annual supply comes from Mexico.

SIMOON, a hot, sand-laden wind which blows periodically for a short time in North Africa and Arabia, and is dreaded for its sand-storms.

SINN FEIN, the Irish national movement aiming at the complete independence of Ireland. The words mean "Ourselves Alone."

SIRENS, in Greek mythology, semi-divine female beings who by their songs lured men to destruction.

SIRIUS, the most brilliant of all the stars, is a member of the constellation of Canis Major (the Greater Dog). It emits about 26 times as much light and heat as the sun, but is 500,000 times farther from us.

SIROCCO, a hot, parching wind which blows from the Sahara in a northerly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

direction over North Africa, the Mediterranean and S. Europe.

SISTINE CHAPEL, the famous chapel of the Vatican, Rome, built in 1473, and adorned by the work of Michelangelo.

SISYPHUS, in ancient Greek legend a son of Æolus, who for his sins was condemned to roll for ever a great stone to a hill-top, from which it rolled back to the bottom.

SKI (pronounced "Shee"), a piece of wood 7 or more feet long, and 5 in. wide, attached to the foot for making movement easy over snow. Ski-ing, which originated in Scandinavia, has become a very popular winter sport. Ski-jumping, off a platform at the foot of a specially-prepared incline, is a form of long jump, the record for which is nearly 80 yards.

SKYSCRAPER is the name given to the steel-frame type of building which originated in the United States. Its principle is a series of steel columns based on massive foundations, and connected by horizontal girders on which the walls of the many stories rest. Diagonal and other bracings give it sufficient stability to resist maximum wind-pressure. The whole weight of the structure falls ultimately on the columns. (*See* HIGHEST BUILDINGS.)

SLATE, a hard rock of highly compressed clay, which splits easily into thin sheets, called slates. These are practically imperishable under normal conditions, and in England are the chief roofing material for houses. The best slates come from N. Wales and Cumberland.

SNAKES are limbless reptiles, with mouths that can be opened very wide. In length they range from a few inches to 20-30 ft. Many of the smaller and medium-sized species have hollow fangs through which they inject poison into their prey. They progress by bending their bodies laterally, in movements which may be compared to the "Dutch roll" on skates; and some species are able to attain a very high speed. (*See* ANACONDA, BOA, COBRA.)

SNIPE, a marsh bird with long legs and beak, esteemed as a table delicacy. There are three British species: the Common, Jack and Great Snipe.

SNOW is atmospheric moisture frozen into ice crystals. It performs the very useful functions of protecting the ground from intense cold, and of creating a reserve of water on high mountains, where it melts during the warmer months and feeds rivers.

SOAP is a combination of alkalis—soda or potash—with animal or vegetable fats (hard soap), or vegetable oils (soft soap). The fat or oil acts merely as a vehicle for the alkali, which is released gradually by rubbing and is the real cleansing agent.

SOCIALISM is the political doctrine which looks to state control and ownership, and the more even distribution of wealth as a cure for social inequalities and evils. It has made great advances in the last half-century, as shown in England by the rise of the Labour Party in Parliament. (*See* LABOUR PARTY.)

SODIUM, a metallic element which has the property of taking fire if dropped into water. Though of little importance in its pure state, it is very valuable as a component of common salt—sodium chloride—washing soda, caustic soda, saltpetre, sodium sulphite, sodium hyposulphite, etc.

SOLAR SYSTEM, the group of heavenly bodies which includes the sun, the planets and all the other small masses which revolve round the sun and planets. (*See* PLANET, SUN.)

SOLE, the most highly esteemed of the flat-fish. There are two main species: the very superior firm-fleshed "Dover" sole and the more watery lemon sole.

SOLSTICE, the two moments of the year when the sun is vertically over the tropics of Cancer and Capricorn, at mid-summer and midwinter respectively (in the northern hemisphere), and is about to move back towards the equator. The word means "halt of the sun."

SOMERSET HOUSE, in the Strand, London, was built in 1776-1786, on the site of the Duke of Somerset's palace. It contains the offices of the Board of Inland Revenue, of the Registrar-General of births, marriages and deaths, and of the Registry of wills.

SOPHISTS, lecturers in ancient Greece, who taught rhetoric and science for fees. The fact that they demanded pay degraded them in the eyes of other teachers.

SOUND is vibrations which affect the organs of hearing. Most sounds come to us through the air, which at sea level transmits vibrations at the speed of 1,100 ft. a second; but sound is conveyed more readily and at greater speed by water and solid bodies. Sound cannot pass through a vacuum. Where vibrations follow at regular intervals, a sound is called a musical note. A jumble of irregular vibrations constitutes a mere noise.

SOUTH SEA BUBBLE, the name for a mania for speculation which overtook England in 1711-1719, as a result of the flotation of the South Sea Company for taking over the National Debt in return for trading privileges. The bursting of the Bubble caused a financial crisis.

SOVIET, a deliberative or legislative council in Russia. Each of the many republics which constitute modern Russia has a central soviet, to which representatives are sent by district soviets; the republics in turn are represented in the Con-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

gress of Soviets of the whole Russian territory. (*See* U.S.S.R.)

SPARROW-HAWK, a British bird of prey, about the same size as the kestrel. Its upper plumage is a bluish-grey, while its under parts are reddish. The tail is marked with dark bars. It lives on small birds and is a bold attacker of young chicks in poultry yards. Formerly it was used in falconry.

SPECIFIC GRAVITY, or RELATIVE DENSITY, is the ratio of the weight (more properly, the mass) of a given volume of a substance to that of the same volume of another substance (normally water) taken as the standard of comparison. A standard temperature is assumed in all cases. Chromium has a specific gravity (sp.g. for short) of 5; that is, a cubic foot of it weighs as much as 5 cubic feet of water at 4 deg. Centigrade.

SPECTROSCOPE, an optical instrument which, by means of glass prisms, breaks up the light from a luminous body into bands of different colours (*see* SPECTRUM). It enables the observer to determine the constitution of a light-emitting body—as every luminous substance has its peculiar spectrum—and provides the astronomer with a means of judging what the stars are made of. The gas helium was detected by the spectroscope as existing in the sun before it was discovered on the earth.

SPECTRUM, the series of bands into which light or other radiant energy is resolved by passage through a prism, owing to rays of different frequency being differently refracted or bent. The spectrum of a beam of sunlight is bands of the following colours, in the order given: violet, indigo, blue, green, yellow, orange, red. They are not sharply defined, but blend into one another. The full spectrum of solar radiation includes, besides the visible spectrum just described, invisible rays both above (chemical or ultra-violet rays) and below it (infra-red and heat rays, etc.).

SPEEDWAY RACING by motor cycles on loose "dirt" tracks, dates, in Great Britain, from 1928, when it was introduced from Australia.

SPERM WHALE.—*See* CACHALOT.

SPHINX, THE, is a great statue, carved out of the solid rock, near the Pyramids of Gizeh. It represents a lion with a human head, and is over 190 ft. long.

SPIDERS are an order of creatures distinguished from insects by having eight instead of six legs. Many species weave webs in which to trap their prey; but others, such as the trap-door spiders, use different methods. The water-spider lives in a kind of diving-bell below the surface. The species most dangerous to man is the poisonous tarantula.

SPINNING is the art of twisting vegetable and other fibres together to form threads suitable for weaving into fabrics. The strength of the thread obtained depends both on the strength of the individual fibres and on the grip which they have on one another. The general principle of spinning cotton, flax, etc., is to draw the fibres out into loose strands, which are further extended and consolidated either by a ring-spinning machine or by a spinning mule, which produces threads fit for the loom.

SPIRITUALISM is the belief that the spirits of the dead are able to communicate with the living. Though in the past it has been discredited by doubtful or fraudulent experiments, psychical research is now regarded as a legitimate branch of science.

SPONGES, as used for washing purposes, are the fibrous skeletons of tiny marine animals which live together in colonies. The best sponges come from the Mediterranean. After being raised from the sea bottom by divers, they are treated to rid them of animal matter.

SPOONBILL, a wading bird of the ibis family. Its beak is curiously flattened out towards the tip.

SPRAT, a small food-fish of the herring family, caught in immense numbers round British coasts.

STALACTITES, icicle-like masses of carbonate of lime hanging from the roofs of limestone caverns. They are formed by water containing carbonic acid, which dissolves lime as it passes through the rock, and deposits some of it as it drips. Corresponding upward-growing bodies on the floor are called stalagmites.

STANDARDIZATION in engineering and manufacture aims at reduction of costs by ensuring that things made by different makers shall conform to certain standard dimensions, and so be interchangeable; and by reducing the number of different sizes and shapes of a given article.

STARCH, a compound of carbon, hydrogen and oxygen which is found in many plants, and especially in the seeds of cereals and the tubers of potatoes, arrowroot, etc. It is a valuable food substance.

STARS are heavenly bodies in space which emit light. The sun is one of countless millions. Their number cannot be estimated with any accuracy, as many are beyond the reach of the most powerful telescope, but it probably runs into some millions of millions. Leaving the sun out of account, the nearest star is 270,000 times more distant than the sun, and the farthest yet seen are so incalculably far

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

away that the light now reaching us from them left them millions of years ago, since when they may have ceased to exist. Some are unimaginably hot and, as compared with the earth, inconceivably dense, owing to their atoms having been disintegrated and consolidated by intense heat and pressure. Some are so huge that, if their centres were in the sun, the earth would be enclosed by their substance. Only about 3,000 stars are visible to the unaided eye.

STEAM is the invisible, odourless gas into which water is converted when heated to boiling point. Its heat is that of the water from which it is disengaged, and in a confined space increases with pressure. In a boiler it may attain a temperature of many hundreds of degrees Fahrenheit.

STEAM ENGINE, a device for converting the heat energy of steam, or, as it may otherwise be expressed, the chemical energy of burning fuel, into mechanical energy or power. The earliest practical application of steam was to pumping water from mines in the seventeenth and eighteenth centuries, Thomas Savery (*c.* 1650-1715) and Thomas Newcomen (1663-1729) being the pioneers. James Watt (1736-1819), Jonathan Hornblower (1753-1815) and others, in the eighteenth century, applied it to driving machinery, and prepared the way for the nineteenth century becoming the Age of Steam. The steam engine was made more efficient by expanding the steam in stages in two, three and four cylinders, of increasing bore. When its development in this direction seemed to be completed there appeared, in 1884, the steam turbine, which enabled the expansion to be carried farther and more energy to be extracted. At present the steam engine is fighting a rival—the internal-combustion engine—for marine propulsion and, in certain spheres, on land. (*See* RAILWAYS, SHIPS, TURBINES.)

STEAM HAMMER, a power-hammer invented by James Nasmyth (1808-1890) in 1839. It consists of a heavy mass of steel at the end of a vertical piston-rod, which is raised by steam admitted under a piston and brought down with great violence by steam admitted above the piston.

STEEL, a metal composed of iron containing up to two per cent of carbon. The greater the proportion of carbon, the greater is the hardness which can be given it by the process of tempering. Until the invention of the Bessemer process of steel-making (*see* BESSEMER PROCESS), steel was very expensive. Since then it has largely replaced iron for the making of railway rails and structural beams and girders. The Bessemer process has to a great extent been superseded by the open-hearth process, which lends itself better to the conversion of certain qualities of pig-iron. Modern metallurgy has produced many steel alloys containing chromium, nickel, vanadium and other metals, which exhibit remarkable toughness and, in the case of "stainless" steel, resistance to corrosion.

STEREOTYPING is a process of making casts from set-up type, for use in printing presses. The mould is formed by beating a thick sheet of papier-mâché, or similar material, on to the type. It is then transferred to a casting box, in which type metal is run into it, reproducing the original type in relief.

STETHOSCOPE, a form of microphone used by medical men for investigating the condition of the heart and lungs. It consists of a hollow tube, ending at one extremity in a flat plate, and at the other branching into two tubes which are inserted into the ears.

STOCK EXCHANGE, an institution for the sale and purchase of Government stocks and other securities, shares of companies, etc. The public is enabled to buy and sell through stockbrokers and stock-jobbers, who are registered members of the exchange, subject to a code of rules. The chief Stock Exchange in Britain is that in Capel Court, London.

STOICS, followers of a school of philosophy founded in Athens by Zeno, in 300 B.C. Stoicism advocated the release of man from the bondage of the passions and appetites, so that his spirit might approach closer to the divine. This doctrine had many adherents among eminent Romans, such as Cato, Cicero and Seneca.

STONE AGE, the period of human development and civilization during which flints and bone were used for tools and weapons, the working of metals being as yet unknown. It is divided into two periods: the earlier, or Palæolithic, marked by roughly-made implements; and the Neolithic, which shows a considerable advance in technique and finish. It may be regarded as having begun about 50,000 B.C. or earlier.

STONEHENGE, on Salisbury Plain, Wiltshire, is probably a prehistoric temple of the Bronze Age, and is one of the most interesting relics of bygone times. It consists of four great circles of stones, which originally were uprights connected by horizontal lintels. Some of the stones are of great size. It now belongs to the nation. A space of 100 ft. in diameter is enclosed.

STORK, a large bird, with long legs, neck and beak; widely distributed over the world. It rarely visits Britain, but is common in Europe, where it nests on chimneys and is regarded as a harbinger of good

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

luck. It feeds on frogs, reptiles and insects. The common stork has white plumage.

STORTING, the Norwegian Parliament, consisting of an Upper House (Lagting) and Lower House (Odelsting).

STRONTIUM, a metallic element, which, when burned, emits a bright red light. Used chiefly in fireworks.

STURGEON, a large fish which attains a length of 10 ft. It spawns in rivers, but passes part of the year in salt water. It is distinguished by the bony shields on its body. In the Volga it is caught for its roe which, when smoked, is called caviare.

STYX, in classical mythology, one of the rivers of the nether world.

SUBMARINE CABLE, a cable, armoured on the outside, and containing insulated conductors for the transmission of telegraphic or telephonic messages. The first was laid in 1850 from Dover to Calais; the first successful transatlantic telegraphic cable was laid in 1866. The total mileage of submarine telegraphic cables is now about 400,000. Recently, the high-speed type, which enables messages to be sent much faster than formerly, has been introduced. The earliest submarine *telephone* cables were laid in 1891. The longest telegraphic cable is that from British Columbia to Australia—over 7,000 miles long.

SUBMARINES are warships which can be completely submerged and travel below the water. They are propelled (in most cases) by internal combustion engines on the surface, and by electric motors, deriving current from batteries charged by the engines, when submerged. Developments in German U-boats enabled those fitted with the Schnorkel, or breathing pipe, to remain for a much longer time below and to recharge without surfacing. Counter measures are the dropping of bombs and depth charges by aircraft flown from escort carriers, the use of convoys shepherded by warships, and various secret means of detection by mechanical devices. During the Second World War U-boat successes were highest in 1942-43.

SUEZ CANAL, connecting the Mediterranean with the Red Sea, was opened in 1869. It shortened the distance between England and India and the East by about 4,000 miles. The canal is about 100 miles long, and is under British control. Since its opening it has been deepened and widened.

SUGAR is a sweet-tasting substance derived chiefly from the sugar-cane grown in tropical climates, and from the sugar beet cultivated in the temperate zones. Cane-sugar is extracted by pressure in mills; beet sugar by soaking in hot water. The extracted sugar is in both cases crystallized by evaporation and refined into lump and granulated forms, the residue or uncrystallizable part being sold as molasses, or treacle. Since the First World War beet sugar has been produced in large quantities in the eastern counties of England.

SULPHUR, a yellow element, derived chiefly from volcanic districts and underground deposits near the coasts of the Gulf of Mexico. In its solid form it is called brimstone, which means "burning stone," as it takes fire easily if heated. It has many compounds, including sulphuric acid or hydrogen sulphate, which is a powerful acid, and has many commercial uses.

SUMMER-TIME, which advances the clock, relatively to solar time, by one hour, was introduced in 1916. By an Act of 1925 it lasts from the day following the third Saturday in April—or, if that day be Easter Day, from the day following the second Saturday—till the end of the first Saturday of October.

SUN, the great heavenly body round which the earth and the other planets revolve. It is about 93,000,000 miles distant from the earth, has a diameter of 866,000 miles and is surrounded by an atmosphere of intensely hot gases. The earth derives most of its heat and light from the sun, though the proportion which it intercepts, relative to the total radiated, is very small.

SUTTEE, the self-immolation of a Hindu widow on her husband's funeral pyre, is a very old custom which was forbidden by the British authorities in India about 100 years ago.

SWALLOW, a small bird which visits Britain to nest in the summer, is distinguished from the martin by its long forked tail and reddish-brown throat. It lives entirely on insects, caught in flight.

SWARAJ, the name of the movement in India which prior to 1947 campaigned for "Home Rule" or independent government.

SWIFT, a bird closely resembling the house martin, but considerably larger, and having a sooty-brown plumage. It is one of the strongest fliers among birds, remaining in the air indefinitely. Whether or not it alights to sleep is an unsolved problem.

SYNDICALISM, a social doctrine which aims at placing industries entirely under the control of the persons employed in them.

TABERNACLE, THE, the movable sanctuary of Jehovah used by the Israelites during their wanderings in the desert and Canaan. A full description of it is given in Exodus xxv-xxvii and xxx.

TAJ MAHAL, the splendid white marble tomb erected by Shah Jehan on the banks of the Jumna, near Agra, India, to hold

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the body of his favourite queen. It was built in 1632-1650, and is magnificently decorated inside.

TALKIES, as they are popularly called, are cinematograph films accompanied by synchronized sounds of the human voice, musical instruments, etc. In most cases the sound record occupies a very narrow band near one edge of the picture film. It consists of minute dark and light bars, which in their passage through the projector interrupt a beam of light thrown on to a photo-electric cell, and cause fluctuations of electric current which are magnified and transformed into sound.

TALMUD, the books of Jewish law later than the written Laws of Moses.

TAMARIND, a tropical tree which bears long pods containing a soft acid pulp used for laxatives.

TANK was the purposely misleading name given to the armoured forts, moving on "caterpillar" tracks, which the British introduced at the Battle of the Somme, July, 1916. Among the types used by the Allies in the Second World War were the "Churchill," weighing about 40 tons and mounting a 6-pounder gun and two heavy machine-guns, the "General Grant," the "General Sherman" and the "Comet," a heavily-armoured cruiser tank equipped with a 77-mm. gun. The Germans employed the "Panther" and the "Tiger," the former armed with a 75-mm. gun and the latter with an 88-mm. gun. Their "Beetle" and "B-4," carrying explosive charges and detonated by remote control, proved ineffective. The largest tank was a Russian type which mounted a gun of 4.9-inch calibre.

TANNIN, or TANNIC ACID, an astringent substance occurring in the bark of the oak and other trees, and used in tanning leather.

TANTALUM, a white metal, one of the elements, intensely hard and able to resist great heat without fusing. Used for filaments of electric lamps.

TANTALUS, in classical mythology, a son of Zeus, who for his misdeeds was stood up to his chin in a lake, the water of which receded if he tried to drink it. Hence our word "tantalize."

TAPIOCA, the starchy substance obtained from the roots of the cassava, and used for puddings.

TAPIR, a mammal allied to the rhinoceros, but much smaller. Different species are found in S. America and Malaya. The nose of a tapir is elongated into a short trunk with the nostrils at the end. Tapirs move about at night, feed on vegetable matter, and are quite harmless.

TAR, a black, treacly liquid obtained from coal or wood by distillation, is valuable both as a preservative and waterproofing agent, and as the source of hundreds of useful substances, including dyes.

TARIFF, a schedule of duties levied on imported goods. The customs tariff which has been in force in this country for many centuries was designed to raise revenue. In February, 1932, Britain came into line with other countries by adding a protective tariff, the object of which was to protect certain home industries against foreign competition.

TARPEIAN ROCK, a cliff on the Capitoline Hill, Rome, from which in old times persons condemned to death for treason were thrown.

TARTARS, or TATARS, people of mixed Mongolian and Caucasian race, inhabiting Siberia, Central Asia and parts of Russia.

TAXES are payments made by the citizen to the government or local authorities to provide funds for necessary national or local expenses—defence, education, health, pensions, police, interest on loans, etc. They fall under two heads: (1) direct taxes, paid to the government or local authority in cash; and (2) indirect taxes which are included in the price of articles, such as spirits, wine, tea and tobacco, which have paid duty when entering the country.

TEA, the dried leaves and young shoots of shrubs grown in China, Ceylon, India and the East Indies. It was introduced into Europe from China in the sixteenth century.

TEAK, the name of a species of large trees grown in India and Burma which yields very valuable timber, used chiefly in shipbuilding and furniture.

TEAL, the smallest species of British wild duck.

TELEGRAPHY, in the sense of sending signals electrically through metallic conductors, entered the practical stage in 1837 with the needle instrument of Cooke and Wheatstone; followed, a few months later, by the dot-and-dash Morse apparatus, which is still widely used, as it is able to leave a permanent record of the message transmitted. The first successful printing telegraph, that of Prof. D. E. Hughes, appeared in 1834. In 1863 and 1868 two different methods of "duplex" transmission were introduced to enable two messages to be sent simultaneously through the same conductor; and, a few years afterwards, came Edison's "quadruplex" system, which increased the number to four. The transmission of messages was speeded up in a different manner by Wheatstone's mechanical transmitter (1867), which enables many hundreds of signals a minute to be sent by running a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

previously punched tape through the instrument.

By means of a device called a "distributor," a circuit can now serve a large number of different transmitting and receiving instruments simultaneously.

The system has been allied with printing apparatus of an extremely ingenious character, much used in post offices.

Submarine telegraphy has benefited, as regards speed and clearness of signals, from the introduction of the "loaded" conductor, and very delicate relaying apparatus at intermediate stations; so that it is still able to hold its own against the competition of wireless telegraphy. (*See* SUBMARINE CABLE, TELEPRINTER, WIRELESS TELEGRAPHY.)

TELEPHONE.—The electric telephone was invented in 1876 by Alexander Graham Bell (1847-1922), a Scotsman by birth, at Boston, U.S.A. A telephone installation includes a transmitting microphone, an electro-magnetic receiver, an induction coil, a call-bell and a battery, connectible at will with similar apparatus at the farther end of two insulated metallic conductors of any length—in some instances thousands of miles long. Words spoken into a transmitter cause fluctuations in the current which affect the receiver at the farther end, where they are reconverted into sounds.

For long-distance transmission, a circuit is subdivided into sections, each provided with amplifying valve relays, which pass the signals on with renewed energy. Modern telephony is founded on the system of exchanges, at which local subscribers can be put into connection with one another; exchanges being so interconnected that every subscriber in the country can talk with any other. Many exchanges are now entirely automatic, enabling a subscriber to call up a number by operating a dial on his instrument. Late developments of telephony include the use of "wireless" waves in metallic conductors, and the transmission of several conversations simultaneously through a single circuit.

TELEPRINTER, an electrical apparatus for transmitting messages from a typewriter at one end of a circuit to a recording typewriter at the other end. It is used in business offices, connected with exchanges under the control of the Post Office.

TELESCOPE.—There are two forms of telescope, the refracting and the reflecting. The first has an eyepiece at one end which magnifies the image cast by a long-focus lens at the other, and is the type in ordinary use. It was invented in 1608 by Hans Lippershey, of Middelberg, Holland, and improved soon afterwards by Galileo (1564-1642). The largest astronomical instruments of this class have object lenses 3 ft. across.

The reflecting, or Newtonian telescope, used only in astronomical observatories, has an open tube with a highly-polished mirror at the back end. This throws an image forward on to a mirror or prism, by which it is deflected into an eyepiece in the side of the tube. The reflector at Mount Wilson Observatory, California, has a mirror 100 in. in diameter, that at Mount Palomar, California, 200 in.

TEMPLE BAR, one of the old entrances to the City of London, opposite the Law Courts, in Fleet Street. It was removed to Theobald's Park, Cheshunt, in 1878, owing to the obstruction caused by it to traffic.

TENCH, a "coarse" river or pond fish, with olive-green scales and dark fins. In the Thames, specimens weighing up to 11 lb. have been taken.

TEREDO, or SHIP-WORM, a marine mollusc which bores into timber below water level, and does much damage in some localities to the piles of piers, jetties, etc.

TERMITES, commonly called white ants, are not true ants. They are common in tropical climates, where they erect huge earthern nests, and are very destructive of woodwork.

TERN, a small bird of the gull family; also called sea-swallow on account of its long, narrow wings and forked tail.

TERRA COTTA, a fine clay, which, when burned in a kiln, has a reddish-brown colour. Used for statuettes, bricks and ornamental parts of buildings.

TERRITORIALS, the force of citizen soldiers which replaced the old Volunteers and Yeomanry in 1908. It gets its name from having units enlisted on a territorial or district basis.

TEST MATCH, a cricket match played between teams representing two different countries, such as England and Australia.

TEUTONS, the general name for the Germanic tribes which occupied N. Europe in the fourth century B.C., and were the stock from which sprang Goths, Norsemen and the Anglo-Saxon tribes which invaded Britain. They are directly represented today by the Germans and Dutch.

THEODOLITE, an important instrument used in land surveying for measuring vertical and horizontal angles.

THEOSOPHY, a mystical modern philosophy which has much in common with the doctrines of Buddhism. First came into prominence in the U.S.A. in 1875.

THERMS make up the British thermal unit (B.Th.U.) of heat, the amount of heat needed to raise the temperature of one pound of water from 60° to 61° Fahrenheit. The great therm, or gas therm, used

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

for reckoning the heating value of gas, is equal to 100,000 standard therms.

THERMOMETER, an instrument for measuring temperature, usually by the expansion of a liquid—mercury or coloured alcohol—in a small glass tube. Ordinary thermometers are graduated in England to the Fahrenheit scale, in which freezing point is 32°, and boiling point 212°, zero being at 32° below freezing point. The Centigrade scale, general on the Continent and for scientific purposes, has a scale of 100° between freezing (zero) and boiling points.

THIRTY YEARS' WAR, a conflict which raged in Germany from 1618 to 1648, between the Protestant States aided by Sweden, and later by France, and the Catholic States. It ended in favour of the former, and left Germany in a devastated and greatly weakened condition.

THOR, the chief of the Scandinavian gods, lord of thunder. His name gave us our Thursday (Thor's day).

THORIUM, a white metallic element, used in the manufacture of incandescent gas mantles and wireless valves.

THUGS, Asiatic bandits, now extinct, who strangled their victims.

THUNDER is the disturbance of the atmosphere by the heating effect of lightning, which causes its sudden expansion and contraction. When the disturbance affects a large area, what is called "rolling" thunder is heard, as the sounds from various distances arrive at different moments.

THURSDAY, the fifth day of the week, named after Thor, the chief of the Scandinavian gods, lord of thunder.

TIDES are the great protuberances of oceanic waters caused by the attraction of the moon (principally) and the sun. They are formed at opposite sides of the world, and recur at any one point at intervals of roughly 12 hours. When the moon and sun are in line and pulling together, the highest, or spring, tides occur; whereas the neap, or lowest, tides come when the two bodies are pulling at different points.

TIGER, a large carnivorous animal of the cat family, widely distributed in Southern Asia, and most common in India. Its handsomely black-striped coat renders it difficult to see when moving in cover. It is much more dangerous to man than the lion.

TIN, a soft white metal found in nature as oxide of tin. Its freedom from corrosion makes it valuable for coating steel and iron sheets (called tin-plate after treatment) to protect them from the air and acids, and for lining cooking utensils.

"TITANIC" DISASTER.—The mammoth White Star liner *Titanic*, sister ship of the *Olympic*, struck an iceberg near Cape Race on April 14, 1912, during her maiden voyage, and sank with the loss of 1,513 lives.

TITANS, in Greek mythology, were the children of Heaven and Earth. Led by Chronos (Saturn), they dethroned their father; but Zeus, son of Chronos, aided by the Cyclops, overthrew them and confined them in Tartarus.

TITHES, payments made annually by landowners to the rector of a parish. Originally they were a tenth part of the crops taken "in kind," but in 1836 a money payment was substituted. This was followed in 1936 by the Tithes Act and the setting up of a Tithes Redemption Commission.

TOBACCO is the prepared leaves of certain species of plants grown in both tropical and temperate countries. One species is popular in gardens for its sweet-smelling flowers. Tobacco smoking is supposed to have been introduced in 1565 from America into England, whence it spread to the Continent. The plant is now cultivated in the U.S.A., West Indies, East Indies, East Africa, Rhodesia, Egypt and many European countries. (*See* NICOTINE.)

"TOC H" (Talbot House), a Christian brotherhood, specializing in social service, which continues the work inaugurated during the First World War at Talbot House, a soldiers' club and chapel opened in Poperinghe, near Ypres, in 1915, and put in charge of the Rev. P. B. Clayton. The movement now has many branches throughout the world. It was named after Reginald Talbot, a young officer killed in the War.

TOGA, the outer garment of a male citizen of ancient Rome. It was a semi-circular piece of woollen cloth, draped over the shoulders and folded round the body to form a cloak.

TOPAZ, a transparent precious stone of yellow, green, red, blue or no colour, composed of aluminium oxide.

TORPEDO, a self-moving submarine mine, including a large explosive charge in its head; engines, driven by compressed air, for revolving propellers at the stern; an apparatus for keeping it at a pre-arranged depth and on a straight course; all enclosed in a smooth casing, 18 in. or more in diameter and some 20 ft. long, tapering towards the nose and stern. It is projected by compressed air from a tube either above the water—in most surface warships—or under water—in the case of submarines.

TORTOISES AND TURTLES are a class of land and water reptiles, remarkable for the horny shells which totally enclose their bodies. The hawk's-bill turtle yields

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the tortoiseshell of commerce; the green turtle is famous for its rich flesh, from which soup is made.

TORY, originally a contemptuous term applied to Irish freebooters who plundered English settlers, was later given to one of the great English political parties. In the middle of the last century it was replaced by "Conservative."

TOTALISATOR, or "TOTE," an automatic betting machine, where the winnings equal all the money staked, less a percentage for expenses.

TOUCAN, a bird of tropical America, remarkable for its huge beak and brilliant plumage.

TOUCHSTONE, a dark, hard stone on which alloys of gold are rubbed to show their composition by the colour of the streak left.

TOWER OF LONDON, THE, the great citadel of the City of London, was begun by William I and completed in the thirteenth century. It was used later partly as a royal residence, partly as a prison for political offenders. Now is a museum and the repository of the Regalia and Crown Jewels.

TOWN HALL, a building for the transaction of municipal affairs, often in the case of a city known as a city hall. An outstanding example of the latter is at Stockholm, built at a cost of over £1,000,000.

TRADE UNIONS are combinations of persons engaged in the same trade or occupation, formed for the purpose of improving working conditions and remuneration, and giving help to distressed members. They are the modern development of the medieval craft guilds, but possess far greater political powers. An Act of Parliament of 1871 made them legal, subject to certain rules, which include registration in prescribed form.

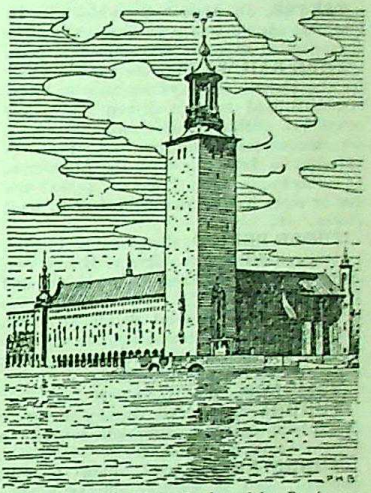
TRAFALGAR, BATTLE OF, fought on October 21, 1805, not far from the Straits of Gibraltar, was the decisive naval engagement of the Napoleonic Wars. The victory won by Lord Nelson—who died during the fight—over the French and Spanish fleets left England in undisputed command of the seas for more than 100 years.

TRAMWAYS, or STREET RAILWAYS, were introduced into England about 1860, but their mileage was small until the invention of the long grooved rail, in 1880 or thereabouts. Until 1891 trams were drawn by horses or, in a few cases, by steam-operated cables or steam locomotives. The use of electric motors taking current from an overhead conductor led to a great increase in the mileage and use of tramways in all countries. The obstruction which trams offer to the heavy traffic of today has led to their abolition in many towns in favour of electric trolley or motor buses.

TRANSUBSTANTIATION, the actual change, by act of consecration by the priest, of the bread and wine of the Eucharist into the actual substance of the body and blood of Christ. A dogma of the Church of Rome, repudiated by the Anglican Church by the twenty-eighth of the Thirty-nine Articles.

TRICOLOUR, the French national flag, adopted during the Revolution, and consisting of three vertical bands of red, white and blue.

TRIGONOMETRY, the branch of mathematics which deals with the relations



Stockholm City Hall, designed by Professor Ostberg. It was commenced in 1911 and completed in 1923. It is regarded as one of the greatest achievements of twentieth-century architecture

of the angles and sides of triangles to one another. Is of great importance to surveying, navigation and astronomy.

TRINITY HOUSE, Tower Hill, London, is the headquarters of the Corporation which grants licences to pilots, and is responsible for the upkeep of lighthouses, buoying channels, etc. It was given a charter by Henry VIII.

TRIUMVIRATE, a combination of three leaders for political purposes. The word was first applied to the compact made between Julius Cæsar, Pompey and Crassus in 60 B.C. Later triumvirates were limited to a period of five years.

TROMBONE, a keyless, brass musical wind instrument, with a sliding part which

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

can be moved to vary the length of the tube and the pitch of the note.

TROPICS, the two parallels of latitude, respectively 23½ degrees north and south of the equator, from which the sun seems to turn back equator-wards at the solstices. The belt between them, called the tropical zone, is the hottest geographical zone. That to the north is the Tropic of Cancer, while to the south is the Tropic of Capricorn.

TROPOSPHERE.—*See* ATMOSPHERE.

TROUBADOURS, wandering poets and minstrels of southern France, who flourished during the eleventh, twelfth and thirteenth centuries.

TSETSE, an African fly which, by its bite, spreads the germs of diseases fatal to domesticated animals, wild game and man.

TUBE RAILWAYS is the popular name for the electric railways running in circular, iron-lined tunnels driven many feet below the surface, each track having its separate tunnel. The first was opened in London, in 1890, between the Monument and Stockwell. The London "tubes" are 100 or more feet below the surface in most places.

TUDOR PERIOD, the period of English history covered by the reigns of Henry VII, Henry VIII, Edward VI, Mary and Elizabeth (1485-1603).

TUILERIES, a great palace at Paris, built in the sixteenth and seventeenth centuries. It has disappeared, except for wings connected with the Louvre.

TUMULUS. (*See* BARROW.)

TUNDRA, a treeless, marshy desert in N. Russia or Siberia, which becomes a frozen waste in winter.

TUNGSTEN, a grey, hard metallic element, used in dyeing, and as a component of self-hardening steels for metal-cutting tools.

TUNNELS.—The longest railway tunnels are the twin "tubes" between Golders Green, Middlesex, and Morden, Surrey, 16 miles 1,100 yards; followed by alternate-route tunnels, 14 miles 1,540 yards long. Then come in order five mountain tunnels: Simplon, 12½ m.; Apennine, 11m.; St. Gotthard, 9½ m.; Loetshberg, 9 m.; Mont Cenis, 8½ m. All but the second pierce the Alps. The longest submarine railway tunnel is that under the Severn, 4m. 1,024 yd. long.

TUNNY, a large food-fish of the mackerel family, which attains a length of 10 ft. and a weight of several hundred pounds.

TURBINES are engines which impart a constant and even turning movement to a shaft on which are mounted vanes revolved by the pressure of water or steam passing between them and an outer casing; or, in some instances, by the momentum of steam or water striking blades at a very high speed. The water turbine, used in many electricity-generating stations, has replaced the old-fashioned water-wheel. The steam turbine, which appeared early in the 'eighties of the last century, is now employed in practically all electricity-generating stations operated by steam, and in most steam-driven high-speed warships and mercantile vessels (*see* SHIPS). One of the great advantages of the steam turbine is its ability to run at very high speeds without serious vibration.

TURBOT, a large and much-esteemed species of flat-fish, spotted on its dark upper side.

TURPENTINE, a liquid derived from the resin of certain species of pine trees, used in the manufacture of paints and varnishes.

TURQUOISE, a blue, translucent, semi-precious stone.

TURTLE-DOVE, a genus of small wild pigeon. One species is fairly common in England.

TWELFTH NIGHT, the evening of the twelfth day after Christmas—the Epiphany. Formerly celebrated as the conclusion of Christmas festivities.

TYBURN, a site near the present Marble Arch, London, on which, until 1784, were gallows for executing criminals.

TYPHOON, a violent circular storm in the China seas.

TYNWALD, the legislative body of the Isle of Man, consisting of a Council and a lower House of Keys.

ULTRAMARINE, a bright blue pigment, formerly made by pulverizing lapis lazuli, but now prepared artificially from china clay, sulphur and carbonate of soda.

UMBER, a brown pigment made from oxides of iron and manganese, mixed with earthy matter.

UNICORN, a fabulous animal with a horse's body and a long, tapering horn projecting from its forehead. It may possibly be a misinterpretation of the rhinoceros. It appears in the Royal Arms of England as one of the "supporters."

UNION, ACT OF, passed in 1800, abolished the Irish National Parliament, and gave the Irish 32 seats in the House of Lords and 100 in the House of Commons; so that for legislative purposes Ireland became one with England and Scotland. Under the Irish Free State (Agreement) Act of 1922, this legislative union ended, except as regards Northern Ireland, which remains part of the United Kingdom.

UNION JACK, THE, the national flag of the United Kingdom, combines the red upright cross on a white ground, of St.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

George of England, with the white diagonal cross, on blue, of St. Andrew of Scotland, and the red diagonal cross, on white, of St. Patrick of Ireland.

UNION OF SOUTH AFRICA, THE, constituted by Act of Parliament in 1909, consists of five provinces: Cape of Good Hope, Natal, the Transvaal, the Orange Free State and the South-West Protectorate. It has a single national parliament of two Houses.

UNITARIANISM, the religious doctrine which rejects the idea of God being a Trinity of persons, and holds that He must be one and undivided.

UNIVERSITY BOAT RACE, THE, between Oxford and Cambridge crews, is rowed from Putney to Mortlake over a course 4¼ miles long.

UNIVERSITY EXTENSION is the name of a movement started at Cambridge in 1873, and since taken up by many other universities, for giving persons not members of a university an opportunity of advancing their education by attending lectures by university professors at local centres.

U.N.R.R.A., in full the United Nations Relief and Rehabilitation Administration, was created on November 9, 1943. Forty-four allied and associated nations agreed to take steps to help victims of German and Japanese aggression when overrun territory was liberated. Food, clothing, shelter, medical supplies and assistance in the resumption of agricultural and industrial production were included in its objects. Parliament voted £80,000,000 towards this end. The Director-General was Mr. Herbert Lehmann, a former Governor of New York State. It was wound up in June, 1947.

URANIUM, a metallic element derived from pitchblende. It emits "alpha" particles, and in doing so changes slowly into radium.

URANUS, in Greek mythology, was the first ruler of the gods, and father of the Titans. (*See* TITANS.)

URANUS, PLANET, the seventh planet in distance from the sun. Discovered by Herschel in 1781. It travels once round the sun, at an average distance of about 1,780,000,000 miles, in 84 of our years. Its diameter is nearly four times greater than the earth's. Round it move five moons.

UR OF THE CHALDEES, from which Abraham came, was in Mesopotamia, near the Euphrates. The site has recently been extensively excavated, and has revealed many interesting proofs of the existence there of very ancient civilizations.

URSA MAJOR, the Great Bear, containing the Dipper, the Plough and Charles's Wain, is one of the chief constellations of the northern sky. Two of its stars, the Pointers, are in an almost direct line with the Pole Star.

URSA MINOR, the Little Bear, is the constellation which includes the Pole Star, its brightest star, now practically in line with the earth's axis.

U.S.S.R., the initials of the Union (of) Soviet Socialist Republics, which is now the collective political title of Russian territories in Europe and Asia. The Union is made up of 16 republics, of which the Russian Socialist Federal Soviet Republic (R.S.F.S.R.) is by far the largest, covering over 6,600,000 square miles.

UTOPIA ("Nowhere"), the title of a work published by Sir Thomas More in 1516, describing an imaginary island in which the inhabitants attained great happiness by the perfection of their political and social development.

UTRECHT, TREATY OF, ended, in 1713, the war between England and France fought to prevent the union of France and Spain.

VACCINATION is the introduction into the body, through a slight surface wound, of a virus, or vaccine, prepared from the germs of a disease, as a protection against the disease in a virulent form. It was first introduced by Jenner in 1798, for smallpox, then a very common and deadly disease; and was made compulsory by an Act of 1853, which in England was modified by a further Act of 1907. The principle has since been extended to other diseases.

VACUUM, an enclosed space from which air has been partially or entirely exhausted. The ordinary suction pump depends for its action on a vacuum being created in its barrel, so that water shall be forced into it by atmospheric pressure.

VALENTINE'S DAY, SAINT, February 14, was formerly observed as the day on which young people sent pictures, letters or other missives to one another. St. Valentine is believed to have been martyred during the reign of the Roman Emperor Marcus Aurelius (*c.* A.D. 270).

VALHALLA, in Scandinavian mythology, the great hall to which passed the souls of warriors slain in battle. The Nazis, to glorify death in battle, erected a Hall of Honour at Bucholtz, near Hamburg. Built in the form of a church, it was decorated with oil paintings of Party leaders and stained-glass windows picturing events in the history of the organization. Instead of the more familiar statues of saints on the exterior, German soldiers carved in stone were placed at the entrance.

VALKYRIES, the beautiful maidens of old Scandinavian legends, who selected

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

those worthy of being slain in battle and escorted them to Valhalla.

VAMPIRE BATS, S. American bats which suck the blood of sleeping animals or human beings.

VANDALS, a Germanic race, closely related to the Goths, which overran Italy, Gaul and Spain in the fifth century. Under Genseric they sacked Rome in 455, and did so much wanton damage that their behaviour gave rise to the word "vandalism." From Spain they crossed to Africa, where successive defeats brought their power to an end.

VANADIUM, a rare metallic element, very difficult to melt. It is used in the manufacture of very tough steels.

VANILLA, a tropical plant, the seed-pods of which yield a delicate essence used for flavouring sweets and confectionery.

VARNISHES are for the most part solutions of resins and gums, such as shellac, kauri gum and copal, in linseed oil or turps. Applied to bare wood or paint, they dry with a hard, glossy surface, protecting, without concealing, what is underneath. Special varnishes are used for coating wallpapers and photographic plates.

VATICAN, the Palace of the Pope at Rome. The lands attached to the Vatican now constitute the Vatican Papal state.

VEDAS, the ancient sacred writings of Hinduism, written in Sanskrit, probably in 1500-1000 B.C. They consist of four books.

VEGETARIANISM, a system of diet which excludes all flesh foods, partly on grounds of health, and partly from humanitarian motives.

VELVET, a textile fabric with a long silk nap formed on one or both faces by weaving loops over wires which are subsequently removed. The loops may be cut or left uncut.

VENUS, in Roman mythology, the goddess of love, and the counterpart of the Greek Aphrodite. The Romans regarded her as the wife of Mars and the mother of Æneas, from whose son, Iulus, the founders of Rome were descended.

VENUS, PLANET, the second planet in distance from the sun, and the nearest to the earth, which it about equals in size. It circles the sun, at an average distance of 67,200,000 miles, in about 225 of our days. Its exceptional brightness—due to reflected sunlight—has given it the names of Evening Star and Morning Star. At long intervals it passes between the earth and the sun; such an occurrence is called a transit of Venus.

VERDIGRIS, a green poisonous deposit formed on copper by the action of acids.

VERSAILLES, TREATY OF, signed at Versailles, Paris, on June 28, 1919, by representatives of the Allies and Germany, brought the First World War to an end. It imposed terms on Germany in regard to the occupation of Rhineland territory for a period of years, the surrender of Alsace-Lorraine to France, and of parts of East Prussia to Poland, and the handing over to the Allies of Germany's colonial possessions. An important feature of the Treaty was the establishment of the League of Nations, which forms the subject of the first 26 articles. (*See* LEAGUE OF NATIONS.)

VERTEBRATES are animals which have backbones. They include all mammals, birds, fishes and reptiles.

VESTALS were the virgin priestesses of ancient Rome, who guarded the temple of Vesta, the goddess of the hearth. Their chief duty was to see that the sacred fire in the temple was kept burning continuously. They were abolished in A.D. 394.

VICEROY OF INDIA, the title of the former Governors-General of India, who normally represented the King-Emperor for a period of five years.

VICTORIA AND ALBERT MUSEUM, South Kensington, London, is devoted to exhibits of woodwork, furniture, metal-work, textiles, architecture, sculpture, book-production, painting, ceramics and other arts. It originated in 1852 in a museum at Marlborough House. The present buildings were opened by Edward VII in 1909.

VICTORIA CROSS, the most coveted of military and naval decorations, was instituted in 1856. It is a bronze Maltese Cross, bearing the words "For Valour," and is awarded for deeds of exceptional bravery during action. Its award carries a small annual pension.

VICTORIA FALLS, on the Zambesi River, South Africa, are among the greatest of the world's waterfalls. The river there tumbles over a cliff 400 ft. high into a chasm, throwing up columns of vapour.

VICTORIA REGIA, a species of South American water-lily, with the largest leaves known, measuring 5-6 ft. across.

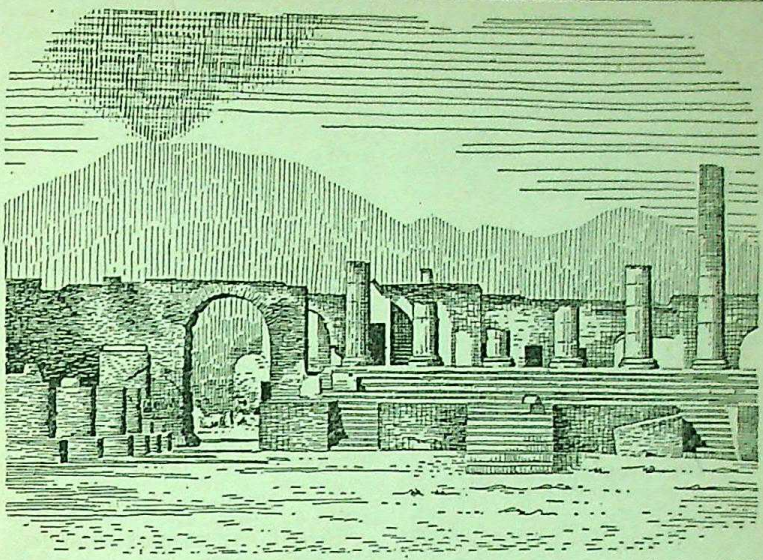
VIENNA, CONGRESS OF (1814-1815), begun after the banishment of Napoleon to Elba, was summoned by the Allies to delimit the territories of various European nations. Poland was handed over to Russia; N. Italy to Austria; Saxony to Prussia; Malta, Cape Colony, Mauritius and part of Guiana to England; and various dynasties in Spain, Naples and elsewhere were re-established.

VIPER, or ADDER, the one poisonous species of British snakes, distinguished by the black markings on its back.

VISCOUNT, a noble of the rank below

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Vesuvius, seen as a shadow in the background, is the active volcano near Naples which overwhelmed Pompeii and Herculaneum in A.D. *79. Some of the ruins are shown here*

that of earl, and above that of baron. The rank was created in 1440.

VITAMINS, substances present in food in very small quantities, but now known to be necessary for health, growth and resistance to disease. Nearly a dozen have already been identified.

VITRIOL. Sulphate of copper is called blue vitriol, sulphate of iron green vitriol, and sulphuric acid oil of vitriol.

VOLCANOES are openings in the earth's crust through which molten or hot matter from the interior is ejected, in most cases by the formation of steam at high pressure. Successive eruptions build up a cone round the opening, which retains a bowl-like top, or crater, as it rises. Some volcanoes discharge vast quantities of hot mud; but in most cases the ejected material is molten rock—lava—which, if rendered very porous by steam, is called pumice—boulders, ashes and dust. The only active volcano on the mainland of Europe is Vesuvius, which has broken out on many occasions in historical times. Etna, in Sicily, and Hecla, in Iceland, are considerably larger. The main volcanic belts run from north to south in America on the line of the Rockies and Andes, and through Japan and New Zealand. One of the most disastrous eruptions of modern times was at Krakatoa, between Sumatra and Java, in 1883. The action was so violent and some of the pumice was hurled so high that, on breaking up, dust particles made the circuit of the globe.

VOLE, the name of a class of small mammals, represented in Britain by the water-vole (water-rat) and the field mouse.

VOLT, the unit of electrical pressure or electromotive force named after Count Alessandro Volta (1745-1827), the Italian physicist. It is the pressure needed to maintain a current of one ampère in a circuit having a resistance of one ohm.

VULTURE, the name of a family of large birds of prey, which feed largely on carrion, and have head and neck more or less bare of feathers. In most countries they are left unmolested, as being useful scavengers.

WAGTAIL, a family of small birds which have the habit of flicking their tails up and down. Two species are known in England, the pied and the grey.

WALCHEREN EXPEDITION, a force of 40,000 men sent under the Earl of Chatham in 1809 to the island of Walcheren, Holland, to capture Antwerp. It achieved partial success, Walcheren and Flushing being captured, but the collapse of Austria prevented Antwerp being taken.

WALDENSES, a religious sect founded in S. France in the twelfth century. Their opposition to the Church of Rome caused them to be persecuted for seven centuries:

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in 1848 they were given freedom of worship.

WALL OF CHINA, GREAT, was built in the fourth century B.C. as a defence against the northern Mongols. With its branches it is about 1,500 miles long. Long stretches of it are still in existence.

WALL STREET, New York, is the great financial centre of the metropolis, in which is situated the chief Stock Exchange of the United States.

WALNUT, a handsome forest tree, which bears nuts—used unripe for pickling, and ripe for dessert. The timber is valuable for furniture and veneers.

WALRUS, a marine mammal related to the seal, from which it is distinguished by its two long tusks, valuable for their ivory.

WAPITI, a species of North American deer, similar to our red deer.

WARBLERS, a family of small birds distinguished by their subdued sweet song. They include the whitethroat, black-cap, willow-wren, chiff-chaff and goldcrest.

WASHINGTON AGREEMENT, a pact made by 26 States in January, 1942, that they would use their full resources against the Axis and its satellites. Each Government agreed to co-operate with the others and not to sign a separate armistice or peace.

WASHINGTON CONFERENCE, a meeting of the Powers in 1921-1922, at which treaties were signed limiting armaments, especially naval armaments, the ratio of capital ships for Great Britain, the United States and Japan being 5-5-3 respectively; of those for Italy and France, about one-third of the first mentioned.

WASPS, a family of stinging insects related to the bees. There are many species. The common wasp makes an underground nest filled with combs of wood-pulp. Only the queens survive the winter. These lay the eggs from which the worker wasps of the next season's nest are hatched.

WATCHES, in the sense of timepieces, were invented about 1500 but, owing to the clumsiness of the earliest examples, did not come into general use till more than 100 years later.

WATERFALLS, GREAT.—In point of volume of water passing over, the La Guayra Falls, on the Parana River, Brazil, take first place; and, as regards height, the Yosemite Falls (2,600 ft.), in the U.S.A. The Kaieteur Falls, British Guiana, have a drop of 800 ft. and a great volume. But the most famous are those at Niagara and the Victoria Falls of the Zambesi, both being now easily accessible. The former of these has been taken toll of for power purposes to a greater extent than any other big waterfall.

WATER GAS, a combustible gas made by passing steam through red-hot coke.

WATERLOO, BATTLE OF, which ended the Napoleonic Wars, was fought near Brussels, Belgium, on June 18, 1815. The combined British, Belgian and German troops, under Wellington and Blücher, scattered the French under Napoleon after a long engagement, and Napoleon was compelled to surrender.

WATERLOO BRIDGE, London, spanning the Thames, was constructed by John Rennie, and opened in 1817. It was closed in 1934 and demolished, and a new bridge was opened for vehicular traffic in 1942.

WATERSPOUT, a column of water connecting the sea with the clouds, caused by a violent local whirlwind.

WATLING STREET, a Roman road which ran from Dover through London and Verulamium (St. Albans) to Wroxeter, near Shrewsbury. Parts of it are still used.

WATT, the electrical unit of power, named after the engineer, James Watt (1736-1829). It is the power passed through a circuit by a flow of one ampère against a resistance of one ohm.

WEASEL, the smallest of a family of carnivorous animals which includes the stoats, polecats and martens. Its body is 6-7 in. long. It preys chiefly on rabbits and rats.

WEAVER BIRDS, a family of African, Asian and Australian finches, which build their nests in great umbrella-shaped clusters, hung from a tree.

WEAVING is the act of interlacing threads to produce a plain or patterned fabric for the making of garments or other articles. One of the most ancient of arts, it remained practically stationary till the invention, in 1785 by Cartwright, of the power loom, which has been greatly improved since. The Jacquard apparatus, controlled by punched cards, enables the most complicated designs to be woven automatically.

WEDNESDAY, the fourth day of the week, named after the Scandinavian god Woden.

WEEVILS, a family of insects, the grubs of which are very destructive to the bark, buds and leaves of plants, and to seeds. The corn weevil attacks grain and biscuits.

WELDING is the process of joining metal parts together by hammering or pressure after they have been heated till in a plastic condition. Welding with the electric arc or oxy-acetylene flame employs intense local heat, which softens the faces of the parts and melts metal so as to run into the joint.

WELLS. Those of small depth are usually dug, and lined with brickwork or

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

concrete; and many wells hundreds of feet deep have been formed in the same manner. Where it is expected that water, if encountered, will rise to the surface by its own pressure, a well of small diameter is sunk with a drill, and lined with steel tubes screwed together. This process is always used for petroleum wells, which have reached depths of up to 10,000 ft.

WEREWOLF. In folklore a man or woman who was changed or was capable of changing into a wolf. The superstition lingered in many parts of Europe until quite recently and was turned to advantage by the Germans during the Second World War. Units of Hitler Youth, specially trained in terrorism against nationals suspected of anti-Nazi leanings, were given this name by Heinrich Himmler, head of the Gestapo and Commander-in-Chief of the German Forces of the Interior.

WESLEYANS.—*See* METHODISTS.

WESTMINSTER ABBEY was built in the thirteenth to the eighteenth centuries on the site of a much older church reared by Edward the Confessor, parts of which may have been incorporated into it. Westminster was then an island known as Thorney, or Isle of Thorns. Every English monarch since his time has been crowned in the Abbey, which till George III's time was the burial place of British sovereigns, as it still is of great statesmen, poets, artists and other leading men. The body of the Unknown Warrior, brought from France and buried "among the kings" to commemorate those who fell in the First World War, was interred near the west door on November 11, 1920. The Cenotaph in neighbouring Whitehall was unveiled on the same day.

WESTMINSTER CATHEDRAL, the chief of Roman Catholic churches in Britain, was built 1895-1903. It is of brick, in the Byzantine style, and its chief feature is a square campanile (St. Edward's Tower), which rises 273 ft. into the air.

WESTMINSTER HALL, near the present Houses of Parliament, is one of London's most historic buildings. It was begun in 1097, and rebuilt in 1397, and now has one of the largest roofs in the world unsupported by pillars. It has been the scene of famous trials, including that of Charles I. It measures 238 ft. by 67½ ft. and is 90 ft. high. The building was severely damaged by an air raid on the night of May 10-11, 1941.

WHALES are marine mammals, the largest of creatures now existing. They are warm-blooded, and breathe atmospheric air, though they are able to remain under water for long periods. They are divided into two great classes: the whalebone whales and the toothed whales. Those of the first class have been largely exterminated, and those of the second class, which includes the sperm and fin whales, are mercilessly hunted for their oil. The invention of the harpoon gun has facilitated capture so greatly that measures were taken to arrest their total disappearance. Their flesh is eaten.

WHEAT, which for many nations is the most important of cereals, is a species of grass which has been cultivated for thousands of years, though it was probably unknown in England till 300 years ago. During the last few decades experiments in wheat-breeding have produced varieties able to be grown successfully in latitudes where the summer is very short, and have thereby greatly extended the wheat-producing areas of the world. The value of wheat lies in its nutritious nature.

WHIPS, PARLIAMENTARY, are members of Parliament whose duty it is to see that other members of their own party take part in divisions for voting.

WHIRLPOOL, a water-eddy caused by a meeting of opposing currents or by obstructions. The Maelstrom, off the Norwegian coast, made famous by Edgar Allan Poe, is only a strong current.

WHISKY, a strong alcoholic spirit derived from barley by fermentation and distillation.

WHITEBAIT are the young of the herring and the sprat. They are caught in great quantities in the Thames estuary during the spring and summer months.

WHITE HOUSE, the official residence, at Washington, of the President of the U.S.A. It corresponds to Britain's No. 10 Downing Street.

WHITE LEAD, carbonate of lead, a white powder which is the basis of many paints used for decorating and protecting wood, metalwork, etc.

WHITING, a small food-fish related to the cod and haddock, and common round the British coasts.

WHITLEY COUNCILS, councils established soon after the First World War, at which representatives of employers and employed meet to discuss questions of wages and working conditions.

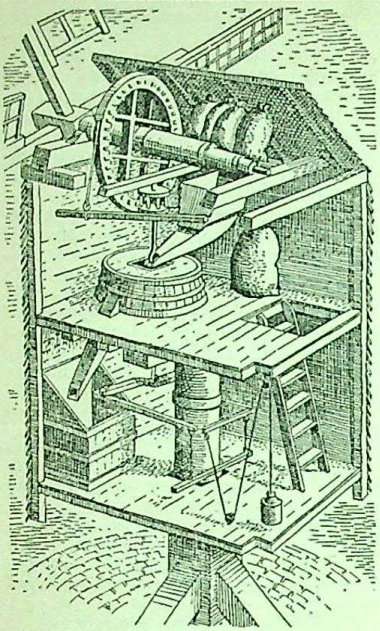
WHIT SUNDAY is the seventh Sunday after Easter Day. It commemorates the descent of the Holy Spirit on to the Apostles at Jerusalem on the day of Pentecost.

WILLOW, a family of trees of which there are several British species, the best-known being the graceful weeping willow—the cricket-bat willow, from the timber of which cricket bats are made.

WINDMILLS, which, before the coming of steam, were much employed to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Interior arrangements of a windmill. Below the wheel are located the enclosed millstones, which are fed from the hopper on the right. The flour runs down the funnel pipe into the bin below

make use of wind-power for the grinding of corn, are now confined, with few exceptions, to the pumping of water.

WINDS are air currents due to the atmosphere being differently heated in different parts of the world. Hot air, being light, rises, and colder air rushes in to take its place. Many winds blow in a circular direction. As their speed increases, they are known as gales, storms and hurricanes respectively. Winds are beneficial in that they distribute rain and moisture and carry away noxious gases.

WINDSOR CASTLE is the chief royal residence of the British Sovereign. It has been developed, out of a fortress built by William I on the site of a more ancient fortification, by additions made at various periods during 800 years. Attached to it are parks totalling nearly four square miles.

WINE is an alcoholic drink produced by the fermentation of sweet fruits, vegetables and even flowers. The principal wines are derived from grapes of various species, differences in which give the derived wines their special characteristics.

WIRE, metal drawn out through discs of decreasing diameter to any required size. Steel wire is very important for fencing and the manufacture of springs; copper wire is used in vast quantities for electrical conductors; and gold and silver wire are employed for various decorative purposes.

WIRELESS TELEGRAPHY, the sending of signals by electro-magnetic waves through the ether, became a practical means of transmission in the closing years of last century, owing largely to the experiments and inventions of Signor Marconi. Its advantages were first demonstrated by the facility of communication given by it between ships and shore and with each other. Notable advances were made possible by the invention, in 1901, of the thermionic valve by Sir J. A. Fleming, and its improvement, three years later, by Dr. Lee de Forest. The valve is now universal for both transmitters and receivers.

WITENAGEMOT, the great council of the king in Anglo-Saxon times.

WITWATERSRAND, or RAND, a range of low hills in the Transvaal, South Africa, in which is the greatest of the world's goldfields. Its riches were discovered in 1886, and since then it has been the chief source of the world's gold supply.

WOLF, the largest quadruped of the dog family. It is distributed over Europe, Asia and North America, and there are several different species. It hunts in packs, and attacks man only when hard pressed by hunger. Since the fifteenth century it has been extinct in England.

WOMEN'S WAR SERVICES in the Second World War included the Women's Voluntary Services for Civil Defence (W.V.S.), founded 1938, the Women's Land Army, the Women's Royal Naval Service (W.R.N.S.), founded in 1917, the Auxiliary Territorial Service (A.T.S.), founded in 1938, and the Women's Auxiliary Air Force (W.A.A.F.), founded in 1939.

WOODCOCK, a bird related to the snipes, but considerably larger. Its flesh is esteemed as a delicacy.

WOODEN HORSE, the great effigy of a horse built by the Greeks to conceal a number of warriors. The Trojans hauled it into Troy, and during the following night the Greeks emerged and opened the city gates to their friends, with the result that Troy was taken.

WOODPECKER, a family of birds which make nesting holes in trees and hunt the bark for insects. There are three British species: the great black, the spotted and (most common) the green.

WOOL, the fibrous coat of sheep, which differs from the hair of other animals in being rougher and more hooked, so that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

it binds or felts together very readily. In cold and temperate climates it is the chief material for clothing, owing to its resistance to damp and the warmth which it gives by being a good insulator of heat, by virtue of the air enclosed between its fibres.

WORLD WARS.—*See* WORLD HISTORY SECTION.

WREN, one of the smallest of British birds, which frequents hedges and is distinguished by its short tail.

WRYNECK, a migratory British bird, which is also called the "Cuckoo's Mate," because it arrives and departs at the same time as the cuckoo.

XYLOPHONE, a musical instrument consisting of a number of wooden bars, each tuned to a note, and struck by a wooden hammer.

YAK, a species of ox, with long hair, inhabiting Tibet and other high lands of Central Asia.

YALE UNIVERSITY, New Haven, Connecticut, U.S.A., founded in 1717, and named after a benefactor, Elihu Yale (1648-1721), is one of the chief American universities.

YAM, a climbing tropical plant, with large, fleshy roots which are cooked in the same way as potatoes.

YARD, the British standard of length: 36 in. or 3 ft. It was finally standardized in 1824. There are various bars marked with the standard yard, one of which is kept in the Houses of Parliament.

YEAR.—The calendar year consists of 365 days; the equinoctial or tropical year, the time taken by the earth to make a circuit of the sun, is 365 days, 6 hours, 13 minutes long. To keep the calendar year in step with the sun, every fourth year has 366 calendar days (*see* CALENDAR). Until the thirteenth century the calendar year began on Christmas Day and afterwards on March 25 (Lady Day). Since the sixteenth century New Year's Day has been January 1, except as regards the legal year, which was not brought into line with it until 1752.

YEAST, a tiny vegetable micro-organism which causes fermentation. It is used for "raising" bread on account of the gas released by its action.

YELLOWHAMMER, a British bird of the bunting family, the male fo which has bright yellow plumage.

YEOMEN OF THE GUARD, a royal bodyguard originated by Henry VII. They attend levées and other court ceremonies, clad in the original Tudor uniform, similar to that of the warders of the Tower of London, who, however, are a separate corps. They are often incorrectly referred to as Beefeaters.

YEW, an evergreen tree, used in old gardens to form hedges. The wood was the favourite for the longbow.

YOUNG MEN'S CHRISTIAN ASSOCIATION (Y.M.C.A.) was founded in 1844 by Mr. (later Sir) George Williams (1821-1905), to give social and religious help to young men. Its activities now cover the civilized world, being greatly extended during the two World Wars.

YOUNG WOMEN'S CHRISTIAN ASSOCIATION (Y.W.C.A.), counterpart for women of the Y.M.C.A., was founded 1855.

ZEBRA, a handsomely striped wild horse, found only in Africa. Three species now exist, the mountain zebra, Grévy's and Chapman's. The last is by far the most common.

ZENANA, the part of a Hindu house reserved for the women. (*See* HAREM.)

ZENITH, the point in the sky vertically overhead.

ZERO, the point on a scale from which measurement or quantity is reckoned in one or both directions.

ZEUS, in Greek mythology, the chief of the gods; the counterpart of the Roman Jupiter.

ZIONISTS, Jews whose ideal it is to make Palestine once again the country of their race. In 1948 Tel Aviv was made the capital of their State of Israel.

ZODIAC, a belt of the heavens extending a few degrees on both sides of the ecliptic, and divided by the old astrologers into 12 sections or "signs" of 30 deg. each.

ZOOLOGICAL GARDENS, Regent's Park, London, were opened in 1828. They cover about 34 acres and contain one of the finest collections of wild animals and birds in the world. In 1931, Whipsnade Zoological Park, near Dunstable, of 500 acres, was opened as an annexe, in which many species enjoy freer conditions.

ZOOLOGY is the science of animal life. It is more restricted than biology, as it does not include the study of plants.

ZOUAVES, French colonial infantry troops, stationed in Algeria. Their uniform includes baggy red trousers and a short blue jacket.

ZUIDER ZEE ("Southern Sea"), a great gulf, having an area of over 2,000 square miles, formed in the Netherlands in the twelfth and fifteenth centuries by irruptions of the sea. The great engineering works for its reclamation ended their first stage in May, 1932, with the completion of a huge dam which separates it from the sea.

ZULUS, a warlike South African race, which in the nineteenth century achieved great power under their rulers, Chaka and his successors. They were finally subdued by the British in the summer of 1906.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

PRACTICAL BUSINESS HANDBOOK

ADDRESS, FORMS OF

King or Queen.—To His (or Her) Most Gracious Majesty, King —— (or Queen). Sire (or Madam). May it please your Majesty. *Conclusion.*—I have the honour to remain, Your Majesty's most obedient Servant. *Verbal address.*—Sir (or Madam).

Royal Family.—To His (or Her) Royal Highness, Prince —— (or Princess). Your Royal Highness. *Conclusion.*—I have the honour to remain, Your Royal Highness's most humble (or obedient) Servant. *Verbal address.*—Sir (or Madam).

Duke.—To His Grace the Duke of ——. My Lord Duke. *Conclusion.*—I beg to subscribe myself, Your Grace's most obedient Servant. *Verbal address.*—Sir.

Duchess.—To Her Grace the Duchess of ——. My Lady (or Madam). *Conclusion.*—Same as for a Duke. *Verbal address.*—Madam.

Marquis.—To the Most Honourable the Marquis of ——. My Lord Marquis. *Conclusion.*—I have the honour to be, Your Lordship's most obedient Servant. *Verbal address.*—Sir.

Marchioness.—To the Most Honourable the Marchioness of ——. My Lady. *Conclusion.*—I have the honour to be your Ladyship's most obedient Servant. *Verbal address.*—Madam.

Earl.—To the Right Hon. the Earl of ——. My Lord. (If the title is a family name the word "of" is omitted.) *Conclusion.*—I have the honour to remain, My Lord, Your most obedient Servant. *Verbal address.*—Sir.

Countess.—To the Right Hon. the Countess of ——. My Lady. *Conclusion.*—Same as for an Earl altered for Lady. *Verbal address.*—Madam.

Viscount or Baron.—To the Right Hon. Lord Viscount, or The Lord ——. My Lord. *Conclusion.*—Your Lordship's obedient Servant. *Verbal address.*—Sir.

Baronet or Knight.—To Sir —— (and first Christian name) Bt. (or Kt.). Sir (and first Christian name). *Conclusion.*—Your obedient Servant. (The wife of a Baronet or Knight takes the title "Lady," and is addressed as "My Lady," with the conclusion, Your Ladyship's obedient Servant.)

Lord Chancellor.—*Begin*—My Lord. *End*—I have the honour to be, with great respect, Your Lordship's most obedient Servant. *Superscribe*—The Right Honourable The Lord Chancellor, etc.

Lords of Appeal in Ordinary.—*Begin* and *end* as to Lord Chancellor. *Superscribe*—The Right Honourable Lord ——.

Lord Chief Justice of England.—*Begin* and *end* as to Lord Chancellor. *Superscribe*—The Right Honourable the Lord Chief Justice of England.

Master of the Rolls.—*Begin*—My Lord (or Sir), *End*—I have the honour to be, My Lord (or Sir), Your (Lordship's) most obedient Servant. *Superscribe*—To the Right Honourable Lord —— (or Sir —— ——), Master of the Rolls; or His Honour The Master of the Rolls.

Lords Justices of Appeal.—*Begin*—Sir (only addressed as "My Lord" when on the bench). *End*—I have the honour to be, Sir, your most obedient and humble Servant. *Superscribe*—The Right Hon. The Lord Justice ——, or The Right Hon. Sir —— ——, Lord Justice of Appeal.

Judges.—*Begin*—Sir (only "My Lord," or "Your Lordship," when on the Bench). *End*—I have the honour to be, Sir, Your most obedient and humble Servant. *Superscribe*—"Hon. ——," or if a Knight, "Hon. Sir ——."

Lord of Session.—*Begin*—My Lord. *End*—I have the honour to be, my Lord, Your Lordship's obedient and humble Servant. *Superscribe*—Hon. Lord ——.

Privy Councillor.—To the Right Hon. ——. Sir. *Conclusion.*—Your obedient Servant. *Verbal address.*—Sir.

Lord Mayor.—To the Right Hon. the Lord Mayor of ——. My Lord Mayor. His wife is styled "Lady Mayoress," and is personally addressed as "Your Ladyship." The Lord Mayors of London and York are the only two entitled to the prefix "Right Hon."

Mayor.—The Worshipful the Mayor of ——. Sir.

Councillors are generally addressed as "Mr. Councillor" so and so.

Ambassador.—To His Excellency the Right Honourable ——, or His Excellency the Ambassador for ——. My Lord.

Archbishop.—To the Most Rev. the Lord Archbishop of ——. My Lord Archbishop, or Your Grace. *Conclusion.*—I remain, My Lord Archbishop, Your obedient Servant. *Verbal address.*—Sir.

Bishop.—The Right Rev. the Lord Bishop of ——. My Lord.

Dean.—The Very Reverend the Dean of ——. Sir.

Archdeacon.—The Ven. Archdeacon of ——. Sir.

Clergy.—The Revd. (with Christian and Surname). Sir.

Cardinal.—His Eminence Cardinal ——, or if also an Archbishop, His Eminence the Cardinal Archbishop of ——.

THE BRITISH COMMONWEALTH

The British Empire was largely built up in the eighteenth and nineteenth centuries. It now includes the United Kingdom of Great Britain and Northern Ireland and the Dominions beyond the Seas, including the self-governing Dominions, Crown Colonies, Protectorates and other Dependencies. It is now often referred to simply as "The Commonwealth."

The Empire's area is over 14,435,000 square miles, or nearly one-quarter of the earth's surface. Its population of roughly 540,000,000 represents (nearly) one-quarter of the entire human race.

Chief Units of the British Empire.	*Area in sq. miles.*	*Population.*
United Kingdom of Great Britain and Northern Ireland	94,633	48,600,000
Dominion of India ..	628,808	226,727,000
Dominion of Pakistan ..	236,638	69,000,000
Ceylon and Maldives ..	26,000	4,550,000
Eastern Asia (including the Malayan Union, etc.)	138,550	5,900,000
Dominion of Canada, incl. Newfoundland ..	3,892,750	12,700,000
West India Islands, South America, Falkland Is..	115,500	2,200,000
Commonwealth of Australia, etc.	3,000,000	7,500,000
Dominion of New Zealand	105,000	1,800,000
South Africa	800,000	10,400,000
West Africa	600,000	20,000,000
East and Central Africa	750,000	16,000,000
Mauritius, Seychelles, etc.	900	450,000
Gibraltar, Malta and Cyprus	3,271	725,000
Antarctic, South Georgia	2,970,000	—

BUSINESS TERMS EXPLAINED

Acceptance.—A bill of exchange which has been accepted by drawee writing "accepted" across the face of bill and signing below the word "accepted."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Accepting Houses.—Bankers with international reputation who are willing, on payment of commission, to accept bills of exchange for traders, that is, they guarantee that the bill will be paid at maturity. Owing to the international reputation of these firms, traders abroad are willing to take their bills, which can be discounted at low rates.

Accommodation Bill.—A bill of exchange accepted by one person—or for the accommodation of another—without any financial profit to the acceptor.

Account Days.—Days on the London Stock Exchange appointed for the settlement of accounts and the delivery of securities.

Accounting.—The study of the financial records of business transactions and of the summaries which are prepared from these records.

Accounts.—Records of business transactions in terms of money as entered in a ledger. Accounts are *Personal*, when relating to the debits and credits of individuals or firms; *Real*, when relating to tangible objects, such as cash, goods or buildings; *Nominal*, when relating to discounts, wages, rent, etc.

Account Sales.—A statement made by an agent who has sold his principal's goods, detailing the prices obtained, and the expenses incurred. Made from the opposite point of view of a *Statement*.

Act of Bankruptcy.—An act or default by a debtor which enables a creditor to present a petition against him in the Bankruptcy Court. These acts include the filing of a declaration of inability to meet his debts; the giving of notice to any creditor that he intends to suspend payment; the assignment of his property to his creditors; prolonged absence from or leaving the country; failure to comply with a bankruptcy notice within seven days; a fraudulent transfer of his property; fraudulent preference of one creditor over another in the transfer of his property.

Act of God.—An event beyond human control, such as earthquake, shipwreck, or lightning, etc., on which loss cannot be enforced by special provision.

Actuary.—Calculates tables of annuities, interests and premiums for insurance purposes.

Ad Libitum.—To be done at pleasure.

Administrator.—One who carries out the provisions of a will without having been authorized by the testator. *See* EXECUTOR.

Ad Valorem.—An assessment for taxation upon the commercial value of the goods and not upon the weight or quantity.

Affidavit.—Formal written statement offered as evidence before a court in the absence of the witness.

Agenda.—A list of business to be brought before a meeting.

Agent.—One who acts for a principal, who thereby becomes responsible. An agent cannot legally divest his principal of responsibility. *See* PRINCIPAL.

Alibi.—Legal proof of a person being elsewhere than is alleged at a particular time.

Allotment.—The examination of applications for shares and the subsequent acceptance of the applications in whole or part by the directors.

Annual General Meeting.—A general meeting must be held by every company once in each calendar year and not more than fifteen months from the date of the preceding one, in order to consider the report and accounts submitted by the directors. At this meeting the dividend is declared, and directors and auditors are elected or re-elected.

Annuity.—A fixed sum of money paid annually or at specified times for a certain period. The probable life of the person is the main factor in calculating the capital cost of life annuities.

Application.—A form which is filled in when applying for shares in a company.

Arbitration.—The settlement of a dispute by an arbitrator, who may be appointed by the parties themselves either at the commencement of the contract or at the time the dispute arises, or who may be appointed by the court in such cases where the settlement of the dispute requires a lengthy examination of documents or a local investigation. The arbitrator makes his award in writing.

Arbitrator.—A person appointed by a court to decide upon the technical or other details of a matter in dispute. *See* REFEREE.

Articles of Association.—The rules and regulations governing the internal working of a limited liability company. They deal with such matters as classes of shares, forfeiture and transfer of shares, meetings, voting, powers and duties of directors, dividends and reserve, accounts and audit.

Assets.—Property of a firm or individual, having a monetary value, such as land, buildings, plant, cash, and including book debts, which is available for the discharge of debts. Property, such as trade-marks, patents or goodwill, is usually regarded as assets. *See* LIABILITIES.

Assignee.—One to whom the legal ownership of property is transferred by an "assignor."

Assignment of Contract.—Liabilities under a contract can be assigned with the consent of the other party. Rights under a contract can be assigned by novation, in which it is agreed by both parties that, say, the creditor shall look for payment to another person, by a legal assignment in writing with notice given to the debtor, by an equitable assignment or by death or bankruptcy.

Assurance.—A contract of assurance, or life insurance, is one under which the insurer agrees in return for one or more premiums to pay to the person for whose benefit the insurance is effected a sum or sums of money after a certain period or after the death of the person whose life is insured.

Attorney, Power of.—An agent who is to enter into deeds on behalf of his principal must be appointed by deed, which is called "Power of Attorney."

Auditor.—One who certifies as to the correctness of business accounts. His business is to find out the precise financial situation of a company or other trading body and to make a report on the accounts and balance sheet, stating whether he has obtained all the information required and whether he considers the balance sheet to be properly drawn up to exhibit a true and correct view of the company's affairs.

Average.—A term applied to expenses, damage, or loss due to perils on the sea. When part of a cargo is sacrificed to save the rest the loss is proportioned among the different owners and is called *General Average*. A *Particular Average* is borne by an individual owner. When the insurers are not wholly liable the risk is said to be *Free* of Particular Average (F.P.A.) or *Free* of General Average. *Free of all Average* means that the cargo is insured against Total Loss only (T.L.O.). An *Average Statement* sets forth the circumstances of loss or damage.

Bad Debts Reserve.—Is made so that the debtors can be shown in the Balance Sheet at their true value. A sum based on the total amount of debtors is charged against profit and loss account in order to make provision for possible bad debts.

Bailment.—Where one person, the bailor, hands his goods to another, the bailee, either for safe custody as in a left luggage office, or for loan or pawn.

Balance of Indebtedness.—The difference between the value of all exports and imports of a country in a particular year, taking into consideration not merely goods but also invisible imports and exports, namely the services one country renders to another in shipping, insurance, banking and investment of money.

Balance of Trade.—The difference between the value of a country's recorded imports and exports for a given year. Where the exports exceed the imports a favourable balance of trade is said to exist, this being based on the view that such a balance indicates prosperity.

Balance Sheet.—A concise summary showing all assets and liabilities. It is a classified list of the ledger and cash balances which remain after those balances which appear in the Trading and Profit and Loss Account have been transferred.

Bank.—Usually a firm which makes a business of borrowing and lending money. The use of the term is not restricted by law in the United Kingdom, but in certain foreign lands banks carry on business under state supervision.

Bank of England.—It acts as the banker to the Government and to other banks. It keeps the country's gold reserve and is the only bank in England and Wales allowed to issue notes.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bank Rate.—The rate of discount at which the Bank of England declares itself ready to negotiate first-class bills of exchange (as distinct from market rate), and which fixes the price of money for the time being.

Bankrupt.—A person who is adjudicated bankrupt by the court and whose property is distributed equally among his creditors. A person who is insolvent and commits an Act of Bankruptcy may have a petition presented by a creditor and a receiving order is made depriving him of the use of his property. He submits a statement of his affairs, and after the creditors have met he is publicly examined on oath in court. If he is adjudicated bankrupt he is termed an undischarged bankrupt and is unable to trade in another name or to obtain credit without disclosing that he is an undischarged bankrupt. Subsequently he may petition for his discharge.

Barratry.—Any wrongful act done wilfully by the master of a ship or by the shipmen against a ship or cargo, such as scuttling.

Bear.—One who sells in order to buy later at a lower price.

Bequest.—A gift made in a will.

Bill Broker.—One who buys and sells bills of exchange, especially when the transfer of a bill adjusts international transactions in merchandise.

Bill of Exchange.—An unconditional order signed by a drawer, calling on the drawee to pay a sum of money at a specified date. The bill is sent by the drawer to the drawee, who accepts it by writing his signature in due form. The bill, or "acceptance," can now pass from hand to hand like a cheque, and if the cash is needed before the date of maturity it can be discounted. *See* DISCOUNT.

Bill of Lading.—A document (usually made in sets of three) constituting a receipt for goods put on board a ship, and also used as proof of title to the goods and as a contract for their transportation.

Bill of Sale.—A document authorizing the sale of specified goods if certain sums are not paid as promised.

Board.—The directors of a limited liability company.

Bona fide (*plural: Bonae fides*).—In good faith.

Bond.—A document entitling the holder to a definite portion of the capital of an undertaking. Coupons are usually attached to entitle the holder to the interest. Goods are "in bond" when the warehouse authorities hold them pending the payment of customs duties, etc. Such goods are moved under bond by bonded carmen.

Bonded Warehouse.—Receives and stores dutiable imported goods until the importer is ready to pay the duty. The owner enters into a bond with the customs authorities that he will not release the goods until the duty has been collected.

Brokerage.—The commission or fee paid to a broker by his client.

Bucket Shop.—Office of an outside broker.

Bull.—One who buys or contracts to buy shares in order to sell later at a higher price.

By-Law.—Regulation made by a local authority or corporation.

Call.—A notice to a shareholder to pay an instalment on his shares. *See* OPTION.

Call Money.—Money lent to bill-brokers, repayable at demand or "call."

Capital.—The excess of assets over liabilities, usually applied to the real or nominal cash value of the surplus assets of a firm either at its commencement, or when its accounts are made up periodically.

Capital Expenditure.—That expenditure which is incurred in purchasing assets for use in the business with a view to earning profits. Examples are: land and buildings, plant and machinery.

Card-Index.—A receptacle holding sets of small cards, usually arranged alphabetically, each card containing specific items of information, such as a name and address of a customer, the prices or sizes of lines of goods, etc. Guide cards are used in a large index to facilitate reference. In a well-kept index any card should be found in less than five seconds.

Carte Blanche.—Full power and authority to act at one's own discretion.

Cartel.—Is a combination of firms engaged in producing similar articles. Each firm retains its individuality but its output and selling prices are fixed by the cartel. Usually a central selling agency markets the joint output.

Caveat Emptor.—"Let the buyer beware," was the common law doctrine that there were no implied conditions or warranties in any contract for the sale of the goods. The doctrine has been somewhat modified by the provisions of the Sale of Goods Act.

Certificate.—Formal documentary evidence of the ownership of stocks or shares.

Certificate of Incorporation.—Certifies that all the requirements of the Companies Act with regard to registration have been complied with and that the association is registered as a company. A public company must, however, comply with certain other requirements before it can commence business.

Certificate of Origin.—Signed by the secretary of the local Chamber of Commerce, certifies that goods have been manufactured in a certain country. The purpose is to take advantage of differential rates of duties levied by some countries.

Chambers of Commerce.—Voluntary organizations formed for the promotion of trade. They have representation on a central body, the Association of British Chambers of Commerce.

Charter Party.—A document whereby a merchant obtains a lease of a ship for a certain voyage to carry a specified or unspecified cargo.

Cheque.—A written order, usually on an appropriate printed form, made by a bank depositor instructing the banker to pay on demand a specified sum of money to a payee. The legal possessor of an open cheque can exchange it for cash at the bank, and it is made payable either to "bearer" or to "order." An "order" cheque needs endorsement. When a cheque is "crossed," the amount can be collected only by payment into some banking account. A cheque may be crossed to some particular bank, and is termed a special crossing, or to some particular account; the words "account payee only" are an indication that the cheque must be paid only into the account of the person named as payee. The words "not negotiable" are sometimes added, and the cheque can still be negotiated, but whoever takes it receives no better title than that of the person from whom he received it. Anyone into whose hands a cheque comes may cross it either generally or specially, and may add the words "not negotiable," or convert a bearer cheque into an order cheque. Only the original drawer, however, can diminish the effect of any of the cautionary actions, and such alterations must be authenticated by his usual signature. Bankers usually refuse to honour cheques which are more than a year old. The bank is liable to the customer for any cheques paid on which the drawer's signature is a forgery.

C.I.F.—Cost, Insurance and Freight. Sometimes written C.F.I.

Circular Note.—A form of banker's draft for the convenience of travellers abroad entitling the holder to obtain cash from the foreign agents of a bank. The bank forwards letters of indication to correspondents at each place at which the traveller desires to draw money, directing payment up to a specified limit. Each letter is signed by both bank and payee.

Civil Proceedings.—Legal suits undertaken to remedy a wrong which is not of a criminal nature.

Claims.—A branch of forwarding work, involved when goods sent by rail or other carrier are lost, damaged, or delayed.

Clearance.—The completion of the formalities of importing and exporting, such as the payment of duties. A ship is cleared from port on receipt of a Custom House permit, showing that all dues have been paid. A cheque is said to be cleared when the banker has collected the amount.

Clearing House.—Bankers' Clearing House is the medium through which bankers settle their mutual claims arising from the payment of cheques. Each bank calculates the amount of cheques and bills due to it and due from it, and pays the difference into or receives the difference from the Account of the Clearing Bankers in the Bank of England. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

reports issued by the Clearing House indicate the state of national trade. The Railway Clearing House used to perform a similar function for rail transport, but is now merged with the Railway Executive.

Client.—A person for whom a lawyer acts; but also commonly applied to the customers of stock-brokers, surveyors, or auctioneers. The "client" of an agent is known as a principal.

C.O.D.—(Cash on Delivery).—Used chiefly in retail trading. Packages up to the value of £40 may now be posted at any Money Order Post Office in the U.K., Channel Islands and Isle of Man (*not* from or to Eire), when they will be delivered by the postman (unless the value is over £10) who will collect the amount due. (*See section on* POST OFFICE REGULATIONS.) Cash can also be obtained against the delivery of parcels sent by rail. (*See the* POST OFFICE GUIDE.)

Codicil.—A subsequent addition to a will made and signed by the testator and duly witnessed some time after the main document has been executed in order to explain or modify its provisions.

Coins.—Definite portions of precious metals, the weight, fineness, or exchange value of which are certified by Government. Standard coins, usually of gold, have a fixed intrinsic value. Token coins have a value in excess of that of the metal.

Collateral Security.—Deeds or property pledged as security for a loan.

Combines.—Amalgamations of firms with the purpose of controlling output and prices. The individual firms may retain their identity, as in a cartel, or be completely merged, as in a trust. Horizontal combines are of firms engaged in the same stage of production. Vertical combines aim at controlling an industry from raw material to finished product.

Committee of Inspection.—A committee of creditors appointed by the entire body of creditors to supervise the winding up of the affairs of a bankrupt individual, concern, or company.

Common Carrier.—Is bound to carry on his regular routes all goods of any persons ready and willing to pay his charges unless the goods are dangerous or not of the type he normally carries, or he has no room for them in his vehicle.

Consignee.—A person to whom goods are sent by a consignor or shipper.

Consolidated Balance Sheet.—Prepared by a Holding Company, it shows the aggregate of the assets and liabilities of all the companies in the combined organization.

Consols.—Loans made to the Government at various times which were consolidated into one single stock.

Consular Invoice.—When goods are shipped to certain countries abroad an invoice in a prescribed form has to be signed by the consul of that country, who retains a copy to ensure that customs duties are not avoided.

Contango.—A charge made for "carrying over" stocks and shares when the buyer does not wish to pay or the seller does not wish to deliver on the appointed day.

Contempt of Court.—Refusal to comply with a legal order.

Contingent Liability.—A liability which may arise in a certain event. Thus if a person discounts a bill of exchange at a bank he has no liability to the bank unless the acceptor of the bill subsequently dishonours the bill.

Contra.—An account when two parties sell each other goods, and the difference, if any, is settled in cash. It is illegal to apply the method to payment of wages.

Contract.—A promise and undertaking made mutually by two or more persons to do, or to refrain from doing, certain acts, and which is enforceable at law. Every agreement which is enforceable at law is a contract. When the document is made with great precision and authenticated with great detail it is a formal contract or deed. Simple contracts may be verbal or implied. A contract to be legally enforceable must have been originally agreed upon by all the parties to it, and the parties must have been capable of legal acts. A contract cannot be made to do any illegal or impossible act, and there must be an absence of misrepresentation or fraudulent intent. The law of contract is the most important part of commercial law.

Co-operative Society.—The distinctive features are that a fixed rate of interest is paid on the loan capital, whilst the profits are divided amongst the members in proportion to their purchases.

Copyright.—The legal right of an author or artist to his original work. The right now subsists merely by an act of publication. Copyright can only be transferred from the author by a definite contract. Besides copyright, the owner has all his common law rights against theft as well as protection against infringement of the copyright.

Cost Accounts.—Kept by manufacturers in addition to the ordinary financial accounts in order to determine the cost of each job or process by analysing the cost of the wages, raw materials, direct expenses of production, and proportion of overhead charges for selling, distribution and organization.

Credit (Cr.).—The right-hand side of a double-entry account, on which are entered all goods, cash, services, or other advantages received from the person or entity named at the head of the account. *See* DEBIT.

Credit, Letter of.—A document, signed by a British bank, authorizing a firm abroad to draw a bill of exchange for a specified amount within a certain time. If the letter of credit is irrevocable it cannot be cancelled and the bank definitely guarantees payment of the bill.

Credit Note.—A document informing a customer that an amount is standing to his credit, as for the return of goods, or some special allowance. The opposite to an invoice. *See* DEBIT NOTE *and* INVOICE.

Cross-Examination.—Questions put to a witness in legal proceedings by or on behalf of the party on the opposite side. If cross-examination brings out any fact likely to injure the witness's side, the witness may be re-examined.

Cum Div.—The price of a stock exchange security when the buyer is entitled to the value of the dividend about to be paid.

Cumulative Preference Shares.—Entitle their holders to arrears of dividend before any dividend is declared on the ordinary shares.

Current Account.—An account with a banker when the depositor has the right to have his money on presentation of a cheque.

Customs Duties.—Taxes imposed on certain goods imported into Britain from abroad. They may be specific duties levied on a quantity or *ad valorem* duties based upon the value of the goods imported.

Customs Drawback.—A refund to the exporter, when goods are re-exported, of the duty paid when the goods were previously imported into Britain.

Custom House.—A Government office at all important ports where duties on imported goods are assessed and collected, where statistics of all goods imported and exported are recorded and where vessels are cleared. Clerks frequenting the Custom House soon acquire the necessary specialized knowledge.

Days of Grace.—Fifteen days of grace are allowed for renewing an insurance premium before the policy lapses. Three days are allowed by statute law in which to pay a bill of exchange. None allowed on bills payable on sight or on demand. If third day of grace is a Bank Holiday the bill is payable on the next day; if a Sunday, Christmas Day, Good Friday or Thanksgiving Day, on the preceding day of business; if a Bank Holiday is followed by a Sunday the bill is due on the Monday.

Debentures.—A bond issued by a limited liability company acknowledging a loan to the company, and agreeing to pay interest at a specified rate whether or not profits are made. A mortgage debenture gives a charge over assets of the company; a simple debenture gives no charge. Debenture holders are not shareholders.

Debenture Stock.—Similar to a debenture but instead of each person having a bond for his separate

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

loan, he has a certificate stating that he owns a portion of one huge loan. Debentures can be transferred only as a whole, whereas a holder may transfer part of his debenture stock.

Debit.—The left-hand side of a double-entry book-keeping account, on which are entered all goods, cash, services, or other advantages received by the person named at the head of the account. Similar entries are made in impersonal or nominal accounts. To debit a person's account is to record his liability to you. *See* ACCOUNTS *and* CREDIT.

Debit Note.—Informs purchaser of goods that his account has been debited in the seller's ledger with a certain amount due to undercharge or omission in the invoice. Sent by purchaser of goods when returning goods.

Deed.—A written or printed document, usually confirming some action such as sale or gift of property. *See* CONTRACT. A *deed of assignment* makes over a debtor's property to a trustee for the benefit of his creditors; usually to avoid bankruptcy. Under a *deed of arrangement* creditors allow a debtor or bankrupt to continue his business under specified conditions and supervision.

Deed of Arrangement.—An arrangement whereby a debtor assigns all his assets to be divided amongst his creditors. The assignment must be registered and have the assent of a majority in value and number of the creditors. The delay and expense of bankruptcy are avoided.

Deferred Shares.—These rank last, after other types of shares, for payment of dividend, and usually receive dividend after the ordinary shareholder has obtained a certain per cent. If the company is prosperous they may be valuable. They are sometimes known as founders' shares when the vendor of a business receives part of his purchase price in this class of shares.

Deflation.—A lessening of the quantity of money in circulation which leads to a lowering of the price level with the result that money is worth more.

Del Credere Agent.—He receives an additional commission for guaranteeing the solvency of those he introduces to his principal, that is, if the person to whom he sells the principal's goods defaults he himself must pay the principal.

Delegatus Non Potest Delegare.—A maxim signifying that an agent cannot delegate his authority to another if the work requires his special skill, or discretion, or necessitates his confidence.

Delivery Note.—A form sent with goods dispatched. It contains the same details as an invoice with the exception of the price. Usually the signature of the person receiving the goods is required on the note or its counterfoil.

Demurrage.—Payment for delay in unloading goods, or for the use of wagons, etc.

Deposit Account.—A bank account bearing interest; the banker need not repay the depositor unless given a stipulated notice, usually seven days.

Deposit Receipt.—Bank's receipt for money deposited which specifies terms of the deposit.

Depreciation.—An allowance in accounting for loss of value caused by wear and tear.

Directors.—Every company registered under the Companies Act must have at least two directors who are chosen by the shareholders to manage its business. The powers of directors are determined by the memorandum and articles of association.

Discount.—A percentage allowed when money is paid before it is due. Bills of exchange are said to be discounted when a banker buys them at their face value, less interest in advance, (i.e. true discount) on the money lent. *See* BANK RATE. A *cash discount* is an allowance for prompt payment. *Trade discount* is allowed off catalogue prices by the manufacturers to dealers. An *export discount* is an allowance in price which enables a manufacturer to dump his goods abroad.

Discount House.—Specializes in discounting bills of exchange, that is, it grants loans to traders on the security of bills. The buyer accepts a bill and guarantees to pay it at a certain date. Rather than wait for the bill to mature, the seller discounts it and obtains its present value.

Dishonoured.—Said of a cheque (or bill) which the banker cannot pay by reason of the state of the depositor's account. The holder of a dishonoured cheque has a good claim against the drawer and against any person who has endorsed it.

Dividend Warrant.—An order to a banker to pay a certain sum of money as dividend to the holder of shares or debentures.

Division of Labour.—The old term for specialization of function in industry. Advantages are that the workers become more efficient by constant repetition, men with special aptitudes can be selected for special jobs, there is economy of time and greater possibility of improvements. The main disadvantage is the monotony.

Double Entry.—The system of book-keeping in which the two-fold aspect of every transaction is recorded in two accounts in order to make a complete record. In one account is shown the receiving of a benefit and in the other account the giving of a benefit.

Draft.—An order made by a banker for payment of cash, generally used when remitting abroad or by travellers whose cheques might not be readily accepted.

Dropped Motion.—A motion is a proposal put forth at a meeting by a proposer. The articles of most companies require the motion to be seconded before it can be discussed. If the motion is not seconded it is termed a dropped motion.

E. and O.E.—A note on an account signifying Errors and Omissions Excepted. It is of no legal value.

Embargo.—A prohibition imposing a restraint on the movement of goods.

Endorsement.—The signature of the payee of a cheque or similar document written on the back when it is made payable to order. The endorsement must resemble the name on the face. Documents are said to be endorsed when they are placed in a paper band and the name of the document is written across the band.

Equitable Mortgage.—Where title deeds of land or property are deposited as security for a loan it is termed an equitable mortgage, as distinct from a legal mortgage, for which a deed is prepared granting the lender a legal interest in the land until the date fixed for repayment of the loan.

Estate.—The total property of a person, when proving a will or when affairs are being adjudicated in bankruptcy.

Ex.—Latin for *out of*, as ex. ss. *Oceanic*. *Ex Div.* or *Ex. D.* refers to the price of a stock exchange security when the buyer does not receive the dividend then about to be paid. *Ex officio* is authority in virtue of holding an office or appointment. *Ex parte* applies to a matter before a court representing one side only; also said of one who intervenes in his own interest between litigants.

Exchange Equalization A/C.—A fund used for the purpose of preventing violent fluctuations in the foreign exchanges.

Excise Duties.—Taxes levied on goods produced within the country.

Executor.—One who carries out the provisions of a will at the request of the testator.

Export Invoice.—A detailed invoice used when exporting goods abroad. The invoice may be local, that is for the actual cost of the goods; or it may be Free on Board, that is cost, plus all charges to put the goods on board ship; or it may be Cost and Freight, that is all charges except insurance to the port of destination; or it may be Cost, Insurance and Freight; or it may be Franco, that is all charges until the goods reach their destination.

Express Post.—A method which expedites the delivery of individual correspondence. For regulations, *see the Post Office Guide*.

Ex-ship, or Free Overside.—A sale of goods, on board ship, all cost and responsibility of removal falling on the buyer.

Ex-warehouse.—A sale of goods, in which whole cost of removal from warehouse falls on the buyer.

Factor.—An agent who has the possession of the goods of his principal, can sell, insure and pledge the goods in his own name and has a lien on the goods for his charges. Compare a broker, who has not

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

possession of the goods and cannot sell in his own name.

F.A.S.—Delivery of goods free alongside ship, the buyers paying for the cost of putting the goods on board.

Felony.—An offence against the criminal law, graver than a misdemeanour. Felonies include murder, manslaughter, bigamy and larceny. A person accused of felony is not entitled to bail of right.

Fictitious Assets.—The name given to items of an intangible nature shown on the assets side of a balance sheet. Examples are rates in advance and similar expenditure for a period not yet expired, a debit balance of profit and loss account which is a loss, and preliminary expenses, which are the expenses of forming a company and are too great to be written off out of the profits on one year.

Fidelity Guarantee.—Where a person guarantees the honesty of another person whilst he is employed in a particular job.

Firm Offer.—The preliminary to a contract when the offer implies specific performance at the price quoted.

Fixed Assets.—Assets acquired for retention by a business for the purpose of carrying on its work. Examples are land and buildings, plant and machinery.

Floating Assets.—Assets held by a business or used in its trading with the ultimate object of converting into cash. Examples are stock, work-in-progress, debtors. They are sometimes called current assets.

Floating Charge.—A method of securing a loan in England, but not in Scotland, by creating a charge over assets such as debtors and stock whose value is constantly changing. The charge is said to crystallize when the lender enforces his security.

Flotsam.—Legal term for goods lost at sea and found floating on the water. Such goods belong to owner, not to finder; but if unclaimed within a year and a day, the goods go to the Crown, and the finder is entitled to a reward proportionately to value of goods.

F.O.B.—Free on Board, the seller paying the cost of delivering goods into the hold of the ship.

Folio.—A sheet of paper of any size folded into two to make four pages. A page in a ledger is called a folio.

F.O.R.—Free on Rail, the seller paying the cost of delivering the goods to the railway company.

Foreign Exchange Market.—Consists of brokers and banks whose business is to facilitate the exchange of currencies of different countries.

Forfeiture of Shares.—The articles of most companies confer powers on the directors to cancel the shares of any shareholder who fails to pay the calls due from him after due notice has been given him. He ceases to be a shareholder and loses the money he has paid on the shares.

Franco (Fco).—When all charges involved in delivery are paid by the seller, such as duties, freight, and dock charges. *See* C.I.F.

Fraud.—Where a false statement is made to induce a person to enter into a contract by someone who knows the statement is false, or does not believe it to be true, and does not care whether it is false or true.

Futures.—Prices quoted on an exchange for future delivery of goods, especially of crops or minerals. An arrangement by which the manufacturer of cotton or wheat passes the risk of alteration of the price of his raw material to a broker, who has expert knowledge of harvests and stocks, and who is prepared to give a price at which he will deliver goods of a particular grade and of a certain quantity at a price fixed at the time the contract was made.

Goodwill.—The additional value due to the reputation of a business or professional person or article of sale.

Gross.—The total cost or weight of goods.

Gross Profit.—The difference between the selling price and the total cost price of the goods sold. The total cost price includes not only the purchase price but expenses necessary to prepare the goods for sale, such as carriage of raw material and wages for manufacturing the goods.

Guarantee.—A somewhat specific kind of warranty usually in the form of an undertaking to make good any defects or loss. *See* WARRANTY.

Hire Purchase Agreement.—A contract whereby the ownership of goods passes after a certain number of periodic payments has been made. In some agreements the hiring can be terminated at any time if notice is given: in others the hiring cannot be terminated and the ownership passes when the final payment is made.

Holder in Due Course.—A person who takes a bill of exchange for value without notice of any defect in the title of the person who negotiated it, and before the bill is overdue. He obtains a perfect title to the bill.

Holding Company.—Any company which holds shares in other companies is a holding company, but the term usually implies that the holding company has a majority, that is over 50 per cent, of the number and value of the shares in another company and so has virtual control of the latter.

Hypothecation.—The pledging or loaning of goods or securities, the owner retaining a technical control. *See* LIEN.

Ignorantia Juris Haud Excusat.—Ignorance of the law does not excuse, hence a contract made through mistake of law is not avoided. If the mistake is one of fact the contract may be avoided in certain cases.

Imprest System of Petty Cash.—The petty cashier receives a sum of money estimated to be sufficient for the period. At the end of each period he receives an amount equal to his payments, and so commences every period with the same imprest amount.

Income and Expenditure Account.—Non-trading concerns such as clubs, hospitals and professional men present their accounts for the year not as a Profit and Loss Account but as an Income and Expenditure Account. This account, which is usually accompanied by a Balance Sheet, shows all the income for the period whether received or owing, and all the expenditure for the year whether paid or due.

Indemnity.—An undertaking to reimburse a person against conditional losses, especially in regard to undiscovered liabilities. *See* INSURANCE.

Indent.—An order from abroad, giving fuller detail than a Home Trade order. In addition to particulars and price, details may be given of packing, shipment and method of payment.

Indentation.—In printed or typed matter a line which does not begin on the regular left-hand margin.

Index Numbers.—A method of comparing the general level of prices by ascertaining from time to time the prices of a large number of commodities. The index numbers are said to be weighted when more importance is attached to articles such as food than to other items purchased less frequently.

Indirect Taxation.—Revenue obtained from customs and excise duties as contrasted with direct taxation, which is levied on incomes.

Injunction.—Order from Court to restrain a person from doing some wrongful act.

Inscribed Stock.—For most government securities the holder does not receive a formal certificate, but merely a receipt as evidence that his holding has been recorded in the books of the Bank of England.

Insolvent.—Unable to pay debts. Not necessarily bankrupt, for an insolvent person becomes bankrupt only when he is so adjudged by the Court.

Insurable Interest.—A term used in insurance or underwriting to denote that a person has, or expects to have, some benefit in a commercial venture. Only persons holding such an interest may take out policies. In the case of life assurance it is sufficient if the person has an insurable interest at the time he effects the insurance, but in the case of fire insurance which is a strict contract of indemnity the insurable interest must also be present at the time the property is destroyed. In marine insurance he must have insurable interest at time of loss, but does not need to have at the time the contract was made.

Insurance.—A contract under which the insurer undertakes to indemnify the person insured against a loss which may arise, or to pay him a sum of money on the happening of a specified event. The chief

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

types are life assurance, accident, fire and marine insurance.

Interim.—An event happening during a recognized period, especially a dividend payment.

Invisible Exports.—Items which affect the balance of indebtedness of one country to another and which do not appear in the Customs return, such as loans, shipping, banking and insurance.

Invoice.—A detailed record of goods supplied sent by the seller of goods to the purchaser to notify the amount due. *See* DELIVERY NOTE, DEBIT NOTE *and* STATEMENT.

IOU.—An informal method of acknowledging a debt in form of a written promise ; does not require a stamp, since it is neither an agreement nor a receipt. If it contains a promise to pay it becomes a promissory note and requires stamping. An IOU is accepted in the court simply as evidence that a debt has been acknowledged, but not necessarily of the amount stated.

Jettison.—To throw cargo overboard to save the ship or the rest of the cargo. *See* AVERAGE.

Jobber.—A member of the London Stock Exchange who expresses his general readiness to deal in securities with any broker. He is forbidden by its rules from dealing with anyone outside the Stock Exchange.

Joint Stock Bank.—A bank incorporated by Royal Charter, such as the Bank of England, or incorporated under the Companies Acts. The latter is subject to the statutory regulations governing limited liability companies.

Joint Stock Company.—An association of persons carrying on business with a view to profit, possessing a capital contributed by the members jointly. The capital is usually divided into shares, which when fully paid up may be converted into stock. In a public company, which has not less than seven members, the shares may be transferred by the holder without reference to other shareholders.

Journal.—A book, or its loose-leaf equivalent, generally used in double entry book-keeping to secure a preliminary analysis of credit purchases, sales and returns. The classified columns of the journal carry the details that would otherwise be set out at length in a ledger account, only the total being transferred to the ledger. It is also used for recording details of the purchases and sale of assets on credit and the correction of errors. The modern tendency is to have a series of journals for each purpose such as a Sales Journal for recording credit Sales. Some firms substitute filed copies of original documents instead of a journal; thus carbon copies of invoices sent are filed as a Sales Journal.

Larceny.—The unlawful taking away of personal goods with the intent to deprive the rightful owner permanently of the same.

Lease.—A written agreement or contract for the use of property.

Ledger.—A principal book of accounts in double entry. Ledgers take various forms, but are chiefly either bound books with numbered pages and indexes, or loose-leaf binders, which are self-indexing. The ledger is frequently subdivided into a Bought Ledger consisting of the accounts of creditors, a Sales Ledger, the accounts of debtors, and a General Ledger containing nominal accounts which represent expenses, losses or gains and real accounts which are the accounts of assets and liabilities. Sometimes the General Ledger is subdivided into a Nominal Ledger containing nominal accounts and a Private Ledger containing real accounts, the capital accounts and trading and profit and loss accounts. *See* CREDIT AND DEBIT.

Legal Tender.—A specified mode of payment which can be demanded and cannot be refused. In the United Kingdom gold and Bank of England notes are legal tender for all amounts. Silver coins are legal tender to the amount of forty shillings and copper to the extent of twelve pence.

Letter of Credit.—A restricted form of circular letter.

Liabilities.—The obligations of a firm, or the amounts, measured in the terms of money, which a firm must pay. Capital, i.e. the excess of assets over liabilities, is entered as a liability on a balance sheet because it is the amount which the firm owes to the proprietor. *See* ASSETS.

Libel.—A defamatory statement about an individual made in writing, pictures or images. Any statement tending to damage a person in the eyes of his (or her) neighbours constitutes a libel on publication. If the statement be made by word of mouth it is a *slander*. Certain forms of libel are criminal.

Lien.—The right of a temporary custodian, e.g. a carrier of goods, to retain them as security for lawful charges.

Limitation Act.—Action cannot be taken on a simple contract after six years from the making, on a deed, after twelve years, and actions to recover land after twelve years except in the case of the Crown, when the time limit is thirty years.

Limited Liability Company.—An association of persons carrying on a business with a view to profit, and possessing a capital contributed by the members jointly. The capital is usually divided into shares, which when fully paid up may be converted into stock. In a public company, which has not less than seven members, the public are invited to invest money and the shares may be transferred by the holder without reference to other shareholders. *See* PRIVATE COMPANY. Companies limited by guarantee are those usually established not to make profits, the individual members guaranteeing the amounts of their shares in the event of winding-up. A *Statutory company* is one formed under Act of Parliament, such as a railway company was before nationalization.

Limited Partnership.—A form of trading whereby a general partner who is liable for all the acts of the partnership may associate himself with limited partners who assume no liability beyond their individual contributions. *See* PARTNERSHIP.

Liquid Assets.—Readily realizable property, such as balances in cash and at the bank, Government stocks and other high-class securities.

Liquidated Damages.—An amount fixed by the parties to a contract, to be paid in the event of a subsequent breach of contract by the party who commits the breach.

Liquidator.—A person appointed by a court of law to wind up the affairs of a company. *See* OFFICIAL RECEIVER.

Lloyd's.—An association of insurance underwriters with headquarters at the Royal Exchange, London. The members accept responsibility for almost any kind of mercantile risk, and especially for shipping risks.

Lloyd's S.G. Policy.—A contract of marine insurance effected by members of Lloyd's association of underwriters. The letters S.G. refer to the Italian for total sum, or to Ships and Goods, but their origin is uncertain.

Loco.—Applicable to prices of goods at a particular place when price does not include delivery.

L.S. (*Locus sigilli*).—The place for the seal on a document.

Making-up Price.—A nominal price of a security agreed upon to facilitate book-keeping on the London Stock Exchange.

Mandamus.—An order made in the High Court calling upon a person to show cause why he should not fulfil some legal obligation.

Marine Insurance.—A contract whereby the insurer undertakes to indemnify the assured against losses incident to marine adventure. The insurance might cover voyage from one place to another, or for a certain period, or may provide a floating cover for merchants who regularly ship goods and who subsequently declare the name of the ship and value of the goods

Memorandum of Association.—The document governing the relation of a company to outsiders. It must state the name of the company, the domicile, that is whether in England or Scotland, the objects of the company, that the liability of the members is limited, and the amount of the share capital.

Merchant Banker.—The old name for Accepting House.

Metre.—A unit of distance in the metric system, about 39$\frac{1}{2}$-in.

Minimum Subscription.—The minimum amount

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

which the directors consider should be raised before commencing business to give the company a fair chance. It must be sufficient to cover the purchase price of property required, expenses of forming the company, repayment of loans and to provide sufficient working capital.

Minutes.—Formal reports of the proceedings of a committee, a board of directors, or meeting.

Misdemeanour.—A crime not so serious as a felony. Included are perjury, blasphemous and defamatory libels, bribery and serious fraud, and some offences such as failing to repair a highway or bridge if it is your duty to do so. A person accused of misdemeanour is entitled to bail.

Misrepresentation.—A false statement of fact made to induce a person to enter into a contract. If made with belief in its truth it is termed innocent misrepresentation; if not it is fraudulent misrepresentation or fraud.

Modus Operandi.—A way of working anything.

Money.—A general commodity, tangible or intangible, which constitutes a means of exchange and a standard of value. Money does not necessarily mean coins or precious metal. Money has a *value* which is fixed by reference to a unit weight of gold, and a *price* which fluctuates according to the supply and demand. *See* COINS, DISCOUNT.

Moneylenders' Contracts.—These require a written memorandum, drawn up before the money is lent and signed by the borrower, giving full details of the loan, the date, the principal and the interest. A copy has to be delivered to the borrower within seven days. The Court has power to reopen a contract if the interest charged is excessive, or the transaction is harsh and unconscionable.

Money Market.—The activity of those in the City of London engaged in granting and receiving loans. The chief dealers in the market are the banks, the discount houses, the accepting houses, the bill brokers and stock brokers.

Money Order.—A method of remitting payments up to £40 through the medium of the Postal Authorities.

Mortgage.—A deed which transfers the ownership of property temporarily as security for a debt. A mortgagor is one who assigns to a mortgagee.

Mortgage Debentures.—Loans to a company secured by a charge over the company's assets.

Motion.—A proposal placed before a meeting for discussion and decision. *See* RESOLUTION.

MS.—Short for manuscript. Plural MSS. (Only one full point.)

Multiple Shops.—A series of shops opened in different shopping districts by a business unit, and controlled from Head Office.

National Dividend.—The total of all the wealth produced by all the population in one year which is available for distribution among the population.

National Income.—The sum total of all the wages, salaries, profits, interest and rent received within a year by a nation.

Negotiable Instrument.—An instrument which, when complete and taken in good faith and for value, confers on the receiver a perfect title, notwithstanding any defect of title on the part of the giver. Examples are bills of exchange, cheques, coins of the realm, dividend warrants, and bearer debentures.

Nem. Con. (*Nemine contradicente*).—Said of a motion passed by a meeting without opposition.

Net.—A price payable without discount or deduction. (Not nett).

Net Profit.—The profit available for distribution, found by deducting from the gross profit all expenses of selling and distribution, administrative expenses and establishment charges.

Nominal Capital.—Also called Authorized Capital, is the amount stated in the Memorandum of Association of a company and on which stamp duty is paid. Frequently part only is issued.

Novation.—An agreement whereby the two parties to a contract agree to look to a third person to perform the obligations in place of one of the contracting parties.

Number.—The sign ‡‡ used in commercial documents to show that packets, etc. are numbered seriatim.

Obsolescence.—Becoming out of date, as for example when machinery has to be scrapped, although not worn out, because of the introduction of new and more efficient machines.

Octavo (8vo).—A sheet of paper of any size folded into 8 leaves or 16 pages, or cut to a standard size, such as post octavo (8 in. by 5 in.), or royal octavo (10 in. by 6½ in.).

Official Receiver.—The person appointed to investigate and manage the affairs of a bankrupt. *See* LIQUIDATOR.

Option.—The right to buy or sell at a fixed price. An option to buy is a "call," to sell a "put."

Ordinary Shares.—Have no special rights. Rank for payment of dividend after preference shares and may be entitled to the remainder of the profits. They may be divided into Preferred Ordinary and Deferred Ordinary, the latter participating in the profits after the former have had a fixed percentage.

O/S. (On sale or return).—Said of goods sent by a manufacturer or agent to a retailer with the condition that those not sold by the retailer may be sent back to the manufacturer, who will return the retailer the money paid for them or make an equivalent allowance.

Oversubscription.—Shares are over-subscribed when applications are received for more than the total issued. Those to whom no shares are allotted receive a refund of their money; those who receive less shares have a proportion of the amount paid carried forward to the credit of the amount due on allotment.

Paragraph.—The sign ¶ or ⁋ used in MSS. to indicate a new paragraph.

Participating Preference Shares.—These entitle the holder to a fixed rate of dividend and to an additional percentage after the ordinary shareholders have received a fixed amount.

Partnership.—The relation which subsists between persons carrying on a business in common with a view of profit. Each partner is an agent of the firm and his acts bind the firm and the partners. Every partner is liable jointly with the other partners for all the debts of the firm, and in addition to the capital he has contributed his private property can be required to pay the debts. A Partnership Deed is usually drawn up dealing with matters such as capital, drawings, interest on capital, interest on drawings and the method of calculating Goodwill, and how the capital is to be repaid in the event of the death or retirement of a partner. When the partners' business is not carried on under the true surnames of all the partners, it must be registered and the names of all partners be shown on business letters, showcards, catalogues, etc. *See* LIMITED PARTNERSHIP.

Party.—A legal term for those who make agreements or contracts between themselves.

Patent.—Short for letters Patent, an open letter from the sovereign to an inventor giving him the sole right to make and sell his invention for sixteen years provided certain fees are paid. There is a Government Office in Southampton Buildings, Chancery Lane, London, where applications for patents are deposited and where specifications can be examined. The Patent Office Library is open free daily.

Per Procurationem (*per pro* or *p.p.*).—The legal term for a signature made or an act done on behalf of another person under authority of a legal document known as a Power of Attorney. The authorized person is called the attorney. The usual form of signature is: "Per pro. Smith and Brown, George Robinson." It is a technical forgery to sign in this manner without authorization. Where a person signs per pro, or for and on behalf of his principal, it indicates that he has limited authority to sign, and that the principal is bound only if the agent had authority to sign. The agent is indicating that he personally is not liable.

Personalty.—All property except land and those interests in land which pass at death to the heir. Personalty includes leasehold land, moveable property, claims to goods, debts, patents and copyrights.

Petty Cash.—A small sum of money kept for making small payments and recorded separately to avoid innumerable small amounts being entered in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the Cash Book. A Petty Cash Book is kept for purposes of record.

Policy.—The document whereby a person or property is assured or insured. *See* ASSURANCE.

Postal Order.—Used to remit small sums of money by post. May be purchased for various amounts plus a commission or poundage. May be cashed at a post office or paid into a bank.

Post-dated.—Said of a cheque or of other document which bears a date subsequent to the date of delivery.

Poste Restante.—Used in addressing missives to be called for at a post office.

Power of Attorney (P/A).—A document authorizing one person to act legally for another. *See* PER PROCURATIONEM.

Preference Shares.—Entitle the holder to dividend at a fixed rate before other shareholders participate. They may be cumulative or non-cumulative, participating or redeemable at a certain date out of profits or out of a fresh issue of shares for the purpose of the redemption.

Premium.—The amount payable in respect of either insurance or assurance. On the Stock Exchange a premium is an extra amount or an additional price for stocks and shares in vogue before the price is quoted in the official list. Also an increment over and above the nominal price of the shares when a new issue is made.

Price.—An amount expressed in the terms of money which the owner will take in exchange for goods or services.

Principal.—The person who instructs and authorizes an agent to act on his behalf. The principal is legally bound by all the acts of his agent within the terms of agency; but an agent must not exceed his authority. *See* AGENT.

Private Company.—It has between two and fifty members, restricts the right of its members to transfer shares, and also prohibits any invitation to the public for its shares or debentures.

Probate.—Copy of a will that has been deposited at Somerset House and proved to be in order.

Profit and Loss Account.—An account showing on the one side the Gross Profit, and any gains such as rent received and discount received, and on the other side all the expenses of selling, of administration and all establishment charges. The difference is Net Profit if the gains exceed the expenses and Net Loss if the reverse.

Pro-forma Invoice.—Similar in detail to an ordinary invoice. Sent with goods on approval or as a means of quotation or to avoid opening a credit account for a small amount, or where the firm is unwilling to allow credit. If the receiver pays the amount the goods are forwarded, if he does not, no entries are necessary in the books.

Promissory Note.—An unconditional promise in writing made by one person to another signed by the maker engaging to pay a sum of money at a specified date. It bears an *ad valorem* stamp duty of 1s. per £100.

Promoter.—A person who takes the initative or an active part in the formation of a public or private company.

Proof of Debt in Bankruptcy.—A creditor's declaration or affidavit, giving particulars of a debt owed to him by a bankrupt.

Prospectus.—The printed announcement of a limited company, giving details of the enterprise and offering to the public, for subscription or purchase, shares or debenture. A form of application is appended.

Pro Tem.—For the time being.

Proximo (Prox.).—Next month.

Proxy.—A document signed by a shareholder authorizing another person to attend a company meeting and vote on his behalf. The person so appointed is often termed a proxy.

Public Trustee.—The Government official who acts when required instead of a private trustee, especially in carrying out the provisions of a will.

Quantum Meruit.—The right to sue for the value of the work done in certain circumstances in case of breach of contract.

Quarto (4to).—An original sheet of paper of any size folded to make 4 leaves or 8 pages. *See* OCTAVO.

Quid pro quo.—An equivalent exchange of goods or services.

Quorum.—Quorum of a meeting is the minimum number of persons who must be present in person or by proxy in order that valid business may be transacted.

Railway Rates.—The rates for carrying goods depend on various factors, such as the value of the goods, the liability to breakage, whether the goods are perishable, distance, whether carried at owner's or company's risk.

Rate of Exchange.—Where countries are on the gold standard, the national money is linked to a certain fixed weight of gold. Hence moneys of different countries on the gold standard are exchanged according to the amount of gold in their standard coins. The rate of exchange of the money of two such countries will fluctuate according to the desire of traders in each country to pay for goods purchased from the other country; but it cannot fluctuate more than the cost of insuring and carrying the gold between the countries, providing they are on the full gold standard, when this can be done.

R/D. (Refer to drawer).—The notation on a cheque, etc., when it is "dishonoured."

Receipts and Payments Account.—A classified summary of the Cash Book used by small societies. It shows the actual receipts and the payments made, but makes no provision for income and expenditure owing or in advance.

Receiving Order.—Order made by court, when satisfied with the truth of the facts presented in a Bankruptcy petition, depriving the debtor of the use of his property and entrusting it to the Official Receiver. This order does not make the debtor bankrupt, but deprives creditors of all remedies apart from bankruptcy.

Referee.—A kind of deputy judge who investigates legal details in a dispute otherwise settled on principle. *See* ARBITRATOR.

Registered Office.—The office of a limited company to which legal notices must be addressed.

Reserve.—A charge against profits to make provision for such future payments as fixed debts, business extensions and bad debts.

Reserve Fund.—Undistributed profits accumulated to strengthen a company, and usually represented by specific investments outside the business.

Residuary Legatee.—The person entitled under a will to receive the surplus assets which remain after the payment of debts, expenses and legacies.

Resolution.—A motion passed at a meeting after being proposed and seconded. *See* MOTION.

Restraint of Trade.—Contracts restricting the right of any person to trade are enforceable providing they are reasonable. Contracts in connection with the sale of the goodwill of a business and price maintenance agreements are examples. Contracts to restrain a former employee from setting up in competition are carefully scrutinized by the court, and, if too onerous, are not upheld.

Revenue Account.—The term includes Profit and Loss and Income and Expenditure Accounts, but refers especially to the accounts of Railways, Canals, Public Utility Companies and Assurance Companies.

Rights.—The privilege possessed by the holder of stocks or shares to participate in some benefit when new capital is issued. A shareholder, for instance, may have the right to acquire new shares at less than the market value. Rights have frequently a market value of their own.

Royalty.—Payment made to a landowner based on the quantity of minerals extracted, or to an author based on the copies of his work sold, or to a patentee for the right to manufacture and sell his patent.

R.S.O. (Railway Sorting Office).—Essential in certain postal addresses.

Salvage.—The reward payable by the owners of goods carried by sea, or by the shipowner, for exceptional services performed at sea by which goods or ships are saved from loss. Also property saved from a fire, wreck, or other damage.

Schedule.—A specific list of goods or claims usually

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

attached to some other document. Schedules are often incorporated in Acts of Parliament.

Seconder.—One who supports a motion immediately after the proposer.

Secret Reserve.—Reserves of undistributed profit whose existence is not disclosed in the Balance Sheet. This is achieved by writing down the value of assets or showing one total amount for Reserves and Creditors on the liabilities side of the Balance Sheet.

Securities.—Investments of all kinds, but especially applied to documents representing indubitable ownership, such as bonds, debentures, mortgages, etc. Registered securities do not pass from hand to hand, but require a document called a transfer signed by both buyer and seller. Bearer securities are those which pass from hand to hand without registration.

Self Balancing Ledgers.—One from whose balances a complete Trial Balance can be extracted. This is done by inserting a control or adjustment account to show in total the double entry aspect. Thus a Sales Ledger has no nominal accounts, but a General Ledger Adjustment Account is added and a Trial Balance can be taken out.

Settling Days.—*See* Account Days.

Shares.—The portions of the capital of a company held by individual owners, who are entitled to a proportionate part of the profits and in the event of the company being wound up to a proportionate part of the value of the assets remaining after debts, claims and expenses have been met. The principal types of shares are preference, ordinary and deferred. *Preference* shares are usually entitled to a first claim on the profits. *Deferred* shares receive dividends only after the ordinary shareholders have participated.

Share Warrant.—A company document issued under the seal of a company signifying that the holder owns so many fully paid shares in the company. It is a negotiable instrument transferable to bearer. Attached to it are coupons for presentation when dividends are due.

Shippers.—The parties to a bill of lading who forward goods to a consignee.

Ship's Manifest.—A detailed list of a ship's cargo, signed by the master or ship-broker.

Sight.—Bills of Exchange payable at sight, date from the days when the time of arrival by ship could not be estimated with certainty. The stamp duty on such bills is twopence.

Sleeping Partner.—One who has capital in a business but takes no part in its management.

Slip.—A temporary document issued by an underwriter at Lloyd's as evidence that a formal policy will be delivered. No action can be taken on the slip alone, but if later on policy is issued the slip may be referred to in disputes over the date.

Solvency.—Ability to pay debts or meet obligations. Insolvency often leads to bankruptcy.

Somerset House.—The Government office in London at which many important records are kept. In the Registry of Joint Stock Companies, upon payment of a fee of 1s. articles of association and list of directors and shareholders of any company can be seen. In the Probate Department copies of any will can be examined. The Registry of Births, Marriages and Deaths is also available. Certain documents can be stamped here and spoilt stamps redeemed.

Specific Performance.—A remedy granted by the Court in cases of breach of contract when damages do not suffice, as for example where the contract relates to the sale of a masterpiece.

Spot.—Prices quoted for goods for immediate delivery or immediate payment.

Standing Order.—A regulation intended to facilitate the business of a meeting, but which can be set aside by the meeting itself.

Statement.—A summary of invoices, etc., usually made at the end of the month, and on presentation of which payment is usually due. *See* Account Sales. *A statement of affairs* details the assets and liabilities of a debtor in bankruptcy.

Statement in Lieu of Prospectus.—Every public company which does not issue a prospectus must file with the Registrar of Companies a statement giving the details required in a prospectus.

Statutory Meeting.—Held by a new company between one and three months after it is entitled to commence business. The members present may discuss any matters relating to the formation of the company, but no resolution of which notice has not been given may be passed.

Stock.—A company may convert its fully-paid shares into stock. Stock may be transferred in any amount unless the Articles state otherwise.

Stock-broker.—A member of a stock exchange who buys and sells securities on behalf of investors. *See* Jobber.

Stock Exchange.—A market for the purchase and sale of stock, shares and other securities.

Stoppage in Transitu.—The right of an unpaid seller, on learning that the buyer is insolvent, to stop the goods whilst in transit, provided that they have not reached their destination, and to retake possession of them.

Sub Judice.—A matter before a court pending decision, and on which neither criticisms nor comments are permitted either in the Press or from a public platform.

Subpœna.—An order issued by a legal authority calling upon a person to attend court to give evidence. A witness is not obliged to attend otherwise, and can demand his legal fee in advance.

Subrogation.—When insurers have met a claim, say for damage by fire, they become subrogated to, that is they can avail themselves of, any claims the insured has against the third parties.

Summons.—An order issued by justices or a magistrate, calling upon a person to answer an alleged charge.

Superannuation Fund.—Fund accumulated from contributions of employees and transfers of profit, from which pensions to retired employees are paid.

Table A.—A model set of Articles of Association given as an appendix to the Companies Act. It constitutes the articles of any company which does not register its own.

Tabular Book-keeping.—A system of book-keeping in which items are classified, and from which it is possible to ascertain the profit on, say, each department or each type of goods sold. Used in hotel accounts.

Tare.—The weight of any package or vehicle apart from the contents.

Tariff.—A list of prices, especially of custom duties.

Testator.—The person, the provisions of whose will are being carried out.

Ticket.—A formal order used on the Stock Exchange to ratify a bargain at the fortnightly account, and used in preparing transfers.

Tort.—A wrongful act committed by one person on another, such as libel and slander, trespass and negligence.

Trading Account.—An account drawn up to find the gross profit.

Trade Marks.—A sign, symbol, or arrangement of letters or words used to identify the goods of a particular manufacturer. Trade Marks are registered at the Patent Office. The Trade Mark Registry can be searched on payment of 1s. in order to find the owner of a mark, etc.

Tramp Steamers.—Engaged in carrying bulky cargoes to any ports at any time in contrast with liners which have regular sailings and fixed routes.

Transfer.—A document signed and witnessed, whereby the ownership of stocks or shares passes from one person to another. Transfers usually bear *ad valorem* duty stamps, and are deposited with the secretary of the company, who issues a new certificate of ownership.

Transfer and Transmission of Shares.—When shares are transferred by the death, bankruptcy or lunacy of a shareholder they pass by transmission; otherwise they pass by transfer.

Tret.—Allowance to purchasers for waste and unavoidable diminution of value of goods.

Trust Deed.—Conveys the property charged under mortgage debentures to trustees, who watch over the interests of all the mortgage debenture holders and sell the property if the company defaults.

Trustee.—One who holds property in trust for the benefit of another. *See* Public Trustee.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Trust Securities.—Certain securities, listed under the Trustees Acts, in which trustees may invest money of a trust. All Government stocks, Bank of England stock, Dominion and Indian loans, and certain industrial interest shares are listed.

T/T. (Telegraphic Transfer).—The most expeditious way of settling a debt, usually applied to transactions between Britain and India. The equivalent mode of exchange with the United States is called Cable Transfer.

Uberrimæ Fidei.—Of the utmost good faith. Contracts of this nature, such as contracts of insurance and guarantee, require good faith between the parties and the mere non-disclosure of material facts will avoid them.

Ullage.—An allowance made in regard to liquor in a cask or barrel.

Ultra Vires.—Outside the scope of. A company or corporation cannot authorize or ratify an act which is ultra vires. If the directors of a company do some act ultra vires the company they are personally liable.

Uncalled Capital.—That portion of the shares issued which has not been called up.

Underwriter.—A person who for a commission underwrites an issue of shares and guarantees to take up any shares for which the public do not subscribe.

Upset Price.—The minimum price at an auction for which the owner will sell. If this price is not reached the property is withdrawn.

Vendee.—One who buys any property.

Vendor.—One who sells any property.

Verbatim.—Word for word. A verbatim report includes every word heard by the shorthand writer, and admits only of the correction of perfectly obvious slips of the tongue.

Via.—By way of. Used in addressing foreign correspondence. When letters are sent by some particular route or vessel, the route or vessel should be specified. *See the* POST OFFICE NOTICES.

Vice versa.—An entire reversal of proceeding or statement.

Voucher.—Any simple documentary evidence relating to money paid or goods delivered.

Wages.—The remuneration paid to an employee. The methods of wage payment are: time rates, so much per hour; piece rates, so much per job; bonus system, giving in addition to a time rate a bonus for efficiency; and profit-sharing schemes.

Warranty.—An undertaking, written or implied, frequently forming part of a contract. *See* GUARANTEE.

Way Bill.—A list of passengers or goods carried by a public conveyance.

Will and Testament.—The written intentions of a person regarding the disposal of his property of every kind after his death. *See* ADMINISTRATOR *and* EXECUTOR.

Winding-up.—The legal processes involved when a limited company discontinues its association, in which case a winding-up order is made by a court of law. Companies are often wound up for the purpose of being reconstituted into a new association and the winding-up process does not necessarily involve a condition analogous to bankruptcy.

Without Prejudice.—Letters or statements to which the words "without prejudice" are affixed cannot be used as evidence in a court of law without the consent of the person responsible.

Writ.—A document issued by a court of law calling upon a person to attend the court and answer some specific allegation. In this connection the word is almost synonymous with *Summons*.

COMMERCIAL ABBREVIATIONS

A1, First-class (of ships).
A/C, Account current.
Affit, Affidavit.
a/d, After date.
AE, Third-class in Lloyd's List.
A/S, Account sales.
@, at.
A/V, Ad Valorem—according to the value of.
b/d, Brought down.
B.D., Bank Draft.
B/E, Bill of Exchange.
b/f, Brought forward.
bot, Bought
B/P, Bill Payable.
B/R, Bill Receivable.
B/S, Bill of Sale.
Bt. fwd, Brought forward.
C.B., Cash Book.
c/d, Carried down.
c. & f., Cost and freight.
c/f, Carried forward.
Chq, Cheque.
c.i.f., Cost insurance and freight.
C/N, Credit Note.
Co., Company.
C/P, Charter Party.
Cr, Credit, creditor.
Cum div., With dividend.
Cum. pref., Cumulative preference.
D/A, Documents against acceptance.
D/A, Documents attached.
d/d, Days after date.
d.f., Dead freight.
Deb, Debenture.
dft, Draft.
D/N, Debit Note.
d/s, Days after sight.
D/W, Dock Warrant.
Encl., Enclosure.
exd., Examined.
8vo., Octavo.
F.A.A., Free of all average.
f.a.s., Free alongside ship.
f.o.b., Free on board.
f.o.r., Free on rail.
F.P.A., Free of particular average.
Frt., Freight.
Fwd., Forward.
4to., Quarto.
G.A., General average.
H.M.C., His Majesty's Customs.
insce, Insurance.
int., Interest.
inv., Invoice.
L/C, Letter of credit.
M, Mille, one thousand.
m/d, Months after date.
M.O., Money Order.
m/s, Months after sight.
N/A, No advice.
N/A, No assets.
N.E., No effects.
Net, Without further reductions.
N/S, Not sufficient funds.
o/a, On account.
P/A, Power of Attorney.
P/Av, Particular average.
p/c, Price Current.
paymt., Payment.
P/C, Petty Cost.
per pro, Per procurationem.
P/N, Promissory Note.
P.p.i., Policy proof of interest.
Recd., Received.
Rect., Receipt.
Sgd., Signed.
S/N, Shipping Note.
St. Ex., Stock Exchange.
T.T., Telegraphic transfer.
Ult., Ultimo—last month.
U/w, Underwriter.

ABBREVIATIONS IN COMMON USE

A., Academy, Academician.
@ For, at, to (in prices).
A1, First-class (*esp. ship*).
A.A., Automobile Association.
A B C, The alphabet; a railway guide.
a/c, Account.
A.D. [L. *anno Domini*], In the year of our Lord.
A.D.C., Aide-de-camp.
ad lib. [L. *ad libitum*]. To any desired extent; at pleasure.
æt., ætat. [L. *ætatis*], In the year of his age, aged.
a.m. [L. *ante meridiem*], Before noon.
A.-N., Anglo-Norman.
A.N.Z.A.C., Australian and New Zealand Army Corps.
A.O.D., Ancient Order of Druids.
A.O.F., Ancient Order of Foresters.
app., Appendix.
approx., Approximate.
Apr., April.
A.R.A., Associate of the Royal Academy.
A.R.A.M., Associate of the Royal Academy of Music.
A.-S., Anglo-Saxon.
A.S.E., Amalgamated Society of Engineers

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A.S.R.S., Amalgamated Society of Railway Servants.
At.-Gen., Attorney-General.
A.U.C. [L. *ab urbe condita*], From the year of the building of the City [Rome, 754 B.C.].
Aug., August.
A.V. (*Bib.*), Authorized Version.
avdp., Avoirdupois.

B.A., Bachelor of Arts.
Bart., Baronet.
Bart's., St. Bartholomew's Hospital.
batt., Battalion; battery.
B.C., Before Christ.
B.Ch. [L. *Baccalaureus Chirurgiæ*], Bachelor of Surgery.
B.C.L. [L. *Baccalaureus Civilis Legis*]. Bachelor of Civil Law, *or* [*Canonicæ Legis*], of Canon Law.
B.Com., Bachelor of Commerce.
B.D., Bachelor of Divinity.
B.D.S., Bachelor of Dental Surgery.
B.E.F., British Expeditionary Force.
B.Eng., Bachelor of Engineering.
Bib., Bible, biblical.
biol., Biology.
B.L., Bill of lading.
B.M.A., British Medical Association.
B.Mus., Bachelor of Music.
bot., Botany.
Bp., Bishop.
Brig.-Gen., Brigadier-General.
Brit., Britain, British, Britannia.
bros., brothers.
B.S., Bachelor of Surgery.
B.Sc., Bachelor of Science.
B.V.M., The Blessed Virgin Mary.
B.W.I., British West Indies.

C., Centigrade.
C.A., Chartered Accountant.
Cantab. [L. *Cantabrigiensis*], Of Cambridge.
Cantuar. [L. *Cantuariensis*], Of Canterbury (signature of Archbishop).
Capt., Captain.
C.B., Companion of (the Order of) the Bath.
C.B.E., Commander of (the Order of) the British Empire.
cent., Centigrade; century.
Cestr. [L. *Cestriensis*], Of Chester (Bishop's signature).
cf. [L. *confer*], Compare.
C.F.I., Cost, freight, and insurance.
cg., Centigram.
C.G.M., Conspicuous Gallantry Medal.
Chas., Charles.
Ch.B. [L. *Chirurgiæ Baccalaureus*], Bachelor of Surgery.
Cicestr. [L. *Cicestriensis*], Of Chichester (Bishop's signature).
C.I.D., Criminal Investigation Department.
C.I.E., Companion (of the Order) of the Indian Empire.
C.-in-C., Commander-in-Chief.
C.I.V., City Imperial Volunteers.
cm., Centimetre.
C.M.G., Companion of (the Order of) St. Michael and St George.
Co., Company; County.
c/o, Care of.
C.O.D., Cash *or* collect on delivery.
Col., Colonel.
coll., Colleague; college.
colloq., Colloquial.
conch., Conchology.
conj., Conjunction.
Consols, Consolidated Funds.
cp., Compare.
C.P.R., Canadian Pacific Railway.
C.S., Civil Service.
C.S.C., Conspicuous Service Cross.
C.S.I., Companion of (the Order of) the Star of India.
cub., Cubic.
cur., Currency, current.
C.V.O., Commander of (the Royal) Victorian Order.
cwt., Hundredweight.

d. [L. *denarius*], penny.
D.C.L., Doctor of Civil Law.
D.C.M., Distinguished Conduct Medal.
D.D. [L. *Divinitatis Doctor*], Doctor of Divinity.
Dec., December.
del. [L. *delineavit*], He (or she) drew it.
D.G. [L. *Dei gratia*], By the grace of God.
div., Divided; dividend.
D.L., Deputy-Lieutenant.
D.Litt., Doctor of Letters.
D.N.B., Dictionary of National Biography.
do., Ditto, the same.
D.O.R.A., Defence of the Realm Act.
doz., Dozen.
D.P.H., Department of, *or* Diploma in, Public Health.
D.Ph., Doctor of Philosophy.
Dr., Debtor; Doctor.
D.S.C., Distinguished Service Cross.
D.Sc., Doctor of Science.
D.S.M., Distinguished Service Medal.
D.S.O., Distinguished Service Order.
Dunelm. [L. *Dunelmensis*], of Durham (Bishop's signature).
D.V. [L. *Deo volente*], God willing.
dwt. [L. *denarius*], Pennyweight, 24 grains troy.

E., East.
E. & O.E., Errors and omissions excepted.
Ebor. [L. *Eboracum*], York; [L. *Eboracensis*], of York (signature of the Archbishop).
Edin., Edinburgh.
E.E.T.S., Early-English Text Society.
e.g. [L. *exempli gratia*], For example.
E.N.E., East-north-east.
Eng., England, English.
E.S.E., East-south-east.
esp., Especially.
Esq., Esquire.
et al. [L. *et alibi*], And elsewhere.
etc. [L. *et cetera*], And the rest.
et seq. [L. *et sequens*], (*pl.*) **et sqq.**, And the following.
etym., Etymological.
ex div., Without next dividend.
Exon. [L. *Exoniensis*], Of Exeter (signature of the Bishop).

Fahr., Fahrenheit.
F.D. [L. *fidei defensor*], Defender of the Faith.
Feb., February.
fec. [L. *fecit*], He (or she) made it.
F.G.S., Fellow of the Geological Society.
fig., Figurative; figure.
flor. [L. *floruit*], He (or she) flourished.
F.L.S., Fellow of the Linnæan Society.
F.M., Field Marshal.
F.O., Foreign Office.
fo., folio.
fol., foll., Following.
Fr., France, French.
F.R.A.S., Fellow of the Royal Astronomical Society.
F.R.C.P., Fellow of the Royal College of Physicians.
F.R.C.S., Fellow of the Royal College of Surgeons.
F.R.G.S., Fellow of the Royal Geographical Society.
F.R.H.S., Fellow of the Royal Horticultural Society.
F.R.Hist.S., Fellow of the Royal Historical Society.
Fri., Friday.
F.R.I.B.A., Fellow of the Royal Institute of British Architects.
F.R.S., Fellow of the Royal Society.
F.S.A., Fellow of the Society of Antiquaries.
F.T.C.D., Fellow of Trinity College, Dublin.
fur., Furlong.
fut., Future.
F.Z.S., Fellow of the Zoological Society.

G., German.
Gael., Gaelic.
G.B.E., Knight Grand Cross of the Order of the British Empire.
G.C.B., Knight Grand Cross of (the Order of) the Bath.
G.C.M.G., Knight Grand Cross of St. Michael and St. George.
G.C.V.O., Knight Grand Cross of the (Royal) Victorian Order.
Gen., General; Genesis.
gen., Gender; genitive.
gent., Gentleman.
Geo., George.
geog., Geography.
geol., Geology.
geom., Geometry
gm., Gramme.
G.M.T., Greenwich Mean Time.
G.O.C., General Officer Commanding.
G.P., General Practitioner.
G.P.O., General Post Office.
G.R. [L. *Georgius Rex*], King George.
gr., Grain; gramme.
gram., Grammar.

H.A.C., Honourable Artillery Company.
H.E.I.C., Honourable East India Company.
Hib., Hibernian.
H.I.M., His (or Her) Imperial Majesty.
Hind., Hindustani.
H.L.I., Highland Light Infantry.
H.M., His (or Her) Majesty.
H.M.S., His (or Her) Majesty's Service or Ship.
Hon., Honourable; honorary.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

h.p., Horse-power.
H.Q., Headquarters.
H.R.H., His (or Her) Royal Highness.
h.w. (*Cricket*), Hit wicket.
H.W.M., High-water mark.

I. [L. *Imperator*, *-trix*], Emperor, Empress.
ib., ibid. [L. *ibidem*], In the same place.
I.C.E., Institute of Civil Engineers.
I.C.S., Indian Civil Service.
I.D., Intelligence Department.
id. [L. *idem*], The same.
I.D.B. (*S. Afr.*) Illicit diamond buyer, *or* buying.
i.e. [L. *id est*], That is.
IHS [Gr. *Ies*], Jesus.
I.L.P., Independent Labour Party.
imp., Imperative; imperfect.
I.M.S., Indian Medical Service.
in., Inch.
Ind., Indian.
Indo-Eur., Indo-European.
Indo-Ger., Indo-Germanic.
Inf., Infantry; infinitive.
infra dig. [L. *infra dignitatem*], Beneath one's dignity.
I.N.R.I. [L. *Jesus Nazarenus Rex Judæorum*], Jesus of Nazareth, King of the Jews.
inst., Institute; institution; instant (of this month).
Inst.Mech.E., Institution of Mechanical Engineers.
interj., Interjection.
I.O., India Office.
I.O.G.T., International Order of Good Templars.
IOU, I owe you.
Ir., Ireland, Irish.
It., Italian, Italy.
ital., Italics.
I.W., Isle of Wight.

Jan., January.
Jas., James.
Jno., John.
J.P., Justice of the Peace.
jun., Junior.

K.B.E., Knight Commander of (the Order of) the British Empire.
K.C., King's Counsel.
K.C.B., Knight Commander of (the Order of) the Bath.
K.C.M.G., Knight Commander of (the Order of) St. Michael and St. George.
K.C.V.O., Knight Commander of the Royal Victorian Order.
K.G., Knight of (the Order of) the Garter.
kllo., Kilogramme.
km., Kilometre.
Knt., Knight.
K.O.S.B., King's Own Scottish Borderers.
K.O.Y.L.I., King's Own Yorkshire Light Infantry.
K.P., Knight of (the Order of) St. Patrick.
K.T., Knight of (the Order of) the Thistle.
Kt., Knight.

L., Latin; Liberal; [F., *livre*] pound.
Lab. (*Polit.*), Labour.
Lat., Latin.
lat., Latitude.
lb. [L. *libra*, *-bræ*], Pound, pounds.
l.b.w. (*Cricket*), Leg before wicket.
l.c. [L. *loco citato*], In the place cited; lower case (of type).
L.C.C., London County Council, *or* Councillor.
L.D.S., Licentiate in Dental Surgery.
L.D.Sc., Licentiate in Dental Science.
Lieut.-Col., -Gen., Lieutenant-Colonel, -General.
Linn., Linnæan.
lit., Literal, literary.
LL.B. [L. *Legum Baccalaureus*], Bachelor of Laws.
LL.D. [L. *Legum Doctor*], Doctor of Laws.
loc. cit. [L. *loco citato*], In the place cited.
log., Logarithm.
long., Longitude.
loq., [L. *loquitur*], He (or she) speaks.
L.S., Linnæan Society; [L. *locus sigilli*], the place of the seal.
L.s.d. [L. *libræ, solidi, denarii*], Pounds, shillings and pence.
Ltd., Limited.
L.W.L., Load-water-line.
LXX, The Septuagint (70).

M.A., Master of Arts.
Maj., Major.
Maj.-Gen., Major-General.
masc., Masculine.
math., Mathematics.
Matric., Matriculation.
Max., Maximum.
M.B. [L. *Medicinæ Baccalaureus*], Bachelor of Medicine.
M.B.E., Member of (the Order of) the British Empire.
M.C., Master of the Ceremonies; the Military Cross.
M.C.C., Marylebone Cricket Club.
M.D. [L. *Medicinæ Doctor*], Doctor of Medicine.
med., Medical.
mem., Memorandum.
Messrs., Messieurs.
meteor., Meteorological.
M.F.H., Master of Foxhounds.
mg., Milligramme.
M.G.C., Machine Gun Corps.
M.I., Mounted Infantry.
mil., Military.
min., Mineralogy; minim.
misc., Miscellaneous.
Mk., Mark (German coin).
Mlle., Mademoiselle.
mm., Millimetre.
Mme., Madame.
M.O., Medical Officer.
mo., Month.
Mon., Monday; Monmouthshire.
M.P., Member of Parliament.
Mr., Mister.
Mrs., Missis, Mistress.
MS. (*pl.* **MSS.**), Manuscript.
Mt., Mount; mountain.
Mus.B., Bac. [L. *Musicæ Baccalaureus*], Bachelor of Music.
Mus.D., Doc. [L. *Musicæ Doctor*], Doctor of Music.
M.V.O., Member of the Royal Victorian Order.

N., North, northern.
n., Neuter; noon, noun.
N.A., North America(n).
N. & Q., Notes and Queries.
nat. hist., Natural history.
naut., Nautical.
nav., Naval.
N.B. [L. *nota bene*], Mark well.
N.C.O., Non-commissioned officer.
N.E., North-eastern.
N.E.D., New English Dictionary (the Oxford English Dictionary).
nem. con. [L. *nemine contradicente*], No one contradicting.
nem. diss. [L. *nemine dissentiente*], No one dissenting.
neut., Neuter.
N.N.E., North-north-east.
N.N.W., North-north-west.
No. [It. *Numero*], (*pl.* **Nos.**) Number.
non-com., Non-commissioned.
non obst. [L. *non obstante*], Notwithstanding.
non seq. [L. *non sequitur*], It does not logically follow.
Norvic. [L. *Norvicensis*], Of Norwich (Bishop's signature).
Nov., November.
nr., Near.
N.R.A., National Rifle Association.
N.S.P.C.C., National Society for the Prevention of Cruelty to Children.
N.S.W., New South Wales.
N.U.R., National Union of Railwaymen.
N.U.T., National Union of Teachers.
N.U.W.W., National Union of Women Workers.
N.W., North-west.
N.Z., New Zealand.

Ob. [L. *obiit*], He (*or* she) died.
O.B.E., Officer of (the Order of) the British Empire.
obj., Object, objective.
ob.s.p. [L. *obiit sine prole*], Died without issue.
O.C., Officer Commanding.
Oct., October.
O.H.G., Old High German.
O.H.M.S., On His (or Her) Majesty's Service.
O.M., (Member of the) Order of Merit.
op. [L. *opus*], Work.
op. cit. [L. *opere citato*], In the work cited.
ornith., Ornithology.
O.T.C., Officers' Training Corps.
O.U.D.S., Oxford University Dramatic Society.
Oxon., Oxford; [L. *Oxoniensis*] of Oxford (Bishop's signature).
oz., Ounce, ounces.

P., Page; (*Naut.*) passing showers; past; pole; (*Mus.*) soft.
P. & O., Peninsular and Oriental (Steam Navigation Company).
par., Paragraph.
Parl., Parliament, parliamentary.
part., Participle.
pass., Passive.
path., Pathology.
P.C., Privy Councillor; Police Constable.
p.c., Post card.
pd., Paid.
per cent [L. *per centum*], By the hundred.
perf., Perfect.
pers., Person, personal.
Ph.C., Pharmaceutical Chemists.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pinx. [L. *pinxit*], He (*or* she) painted it.
P.M., Prime Minister; Postmaster; Provost Marshal.
p.m. [L. *post meridiem*], Afternoon.
P.M.G., Paymaster- *or* Postmaster-General.
P.M.O., Principal Medical Officer.
P.O., Postal order; post office; Petty Officer.
P.O.D., Pay on delivery.
P.O.P. (*Phot.*), Printing out paper.
pop., population.
poss., Possessive.
P.O.W., Prisoner of War.
P.P., Parish priest.
pp., Pages.
p.p., Past participle.
p.p.c. [F. *pour prendre congé*], To take leave.
P.P.S., Additional postscript; Parliamentary Private Secretary.
P.R.A., President of the Royal Academy.
Preb., Prebendary.
pref., Prefix; preference.
Pres., President.
Prin., Principal.
P.R.O., Public Relations Officer.
pro., Professional.
Prof., Professor.
Prom., Promenade (concert).
pron., Pronoun.
Pro tem. [L. *pro tempore*], For the time being.
Prox. [L. *proximo*], Next month.
Prox. acc. [L. *proxime accessit*], He (or she) came next.
P.S. [L. *postscriptum*], Postscript.
Ps., Psalm, Psalms.
P.T., Physical Training.
pt., pint(s)
Pte., Private (Army).
P.T.O., Please turn over.
P.W.D., Public Works Department.

Q.A.I.M.N.S., Queen Alexandra's Imperial Military Nursing Service.
Q.A.N.T.A.S., Queensland and Northern Territory Air Service.
Q.B., Queen's Bench.
Q.C., Queen's Counsel.
Q.E.D. [L. *quod erat demonstrandum*], Which was to be proved.
Q.E.F. [L. *quod erat faciendum*], Which was to be done.
Q.E.I. [L. *quod erat inveniendum*], Which was to be found out.
Q.F., Quick-firing (gun).
Q.M., Quartermaster.
Q.M.G., Quartermaster-General.
Q.M.S., Quartermaster-Sergeant.
qq.v. [L. *quod vide*], Which (things, etc.) see.
q.v. [L. *quod vide*], Which see.
qy., Query.

R.A., Royal Academy *or* Academician; Royal Artillery.
R.A.C., Royal Automobile Club; Royal Armoured Corps.
R.A.F., Royal Air Force.
R.A.M., Royal Academy of Music.
R.A.M.C., Royal Army Medical Corps.
R.A.O.C., Royal Army Ordnance Corps.
R.A.S.C., Royal Army Service Corps.
R.B.A., Royal (Society of) British Artists.
R.C., Roman Catholic.
R.C.M., Royal College of Music (London).
R.C.M.P., Royal Canadian Mounted Police.
R.C.O., Royal College of Organists.
R./D., (*Banking*) Refer to drawer.
R.E., Royal Engineers.
regt., Regiment.
rel., Relative, relatively.
R.E.M.E., Royal Electrical and Mechanical Engineers.
ret., Retired.
Rev., Reverend.
R.F.A., Royal Field Artillery.
R.F.C., Royal Flying Corps.
R.G.A., Royal Garrison Artillery.
R.H.A., Royal Horse Artillery
R.H.S., Royal Humane Society; Royal Horticultural Society.
R.I.P. [L. *Requiescat in pace*], May he (or she) rest in peace.
Rly., Railway.
R.M., Resident Magistrate.
R.M.A., Royal Marine Artillery.
R.M.S., Royal Mail Service.
R.N., Royal Navy.
R.N.A.S., Royal Naval Air Service.
R.N.D., Royal Naval Division.
R.N.R., Royal Naval Reserve.
R.N.V.R., Royal Naval Volunteer Reserve.
Roffen. [L. *Roffensis*], Of Rochester (the Bishop's signature).
Rom., Roman.
R.S., Royal Society.
R.S.P.C.A., Royal Society for the Prevention of Cruelty to Animals.
R.S.V.P. [F. *Répondez s'il vous plaît*], Please reply.
Rt. Hon., Right Honourable.
Rt. Rev., Right Reverend.
R.U., Rugby Union.
R.V., Revised Version (of the Bible).
Ry., Railway.
R.Y.S., Royal Yacht Squadron.

S., Saint; Saxon; south, southern.
s., Shilling; singular.
$, Dollar.
Sansk., Sanskrit.
Sarum, Of Salisbury (the Bishop's signature).
Sc., Science; Scotch.
sc. [L. *sculpsit*], He engraved it.
S.E., South-east *or* Eastern.
Sen., Senate, senator; senior.
Sept., September.
seq. (*pl.*) **seqq.** [L. *sequens*], The following.
Sgt., Sergeant.
Shak., Shakespeare.
sing., Singular.
S.J., Society of Jesus (Jesuits).
S.O., Stationery Office.
S O S, Radio or other morse code signal used in cases of great distress or danger (arbitrary; but usu. extended to "Save our souls").
sov., Sovereign.
Sp., Spain, Spanish.
s.s., steamship.
S.S.E., South-south-east
S.S.W., South-south-west.
St., Saint; strait; street.
S.T.D. [L. *Sacræ Theologiæ Doctor*], Doctor of Theology.
stg., Sterling.
suf., suff., Suffix.
supp., Supplement.
supt., Superintendent.
surg., Surgeon, surgery.
s.v.p. [F. *s'il vous plaît*], If you please.

T.C., Town Councillor.
T.C.D., Trinity College, Dublin.
Temp., Temperature; temporary; (L.) *tempore*, "in the time of."
Teut., Teuton, Teutonic.
Thos., Thomas.
Truron. [L. *Truronensis*], Of Truro (signature of the Bishop).
T.T., Teetotaler.
T.U., Trade Union.
T.U.C., Trade Union Congress.

U.D.C., Urban District Council.
Univ., University.
U.P., United Presbyterian.
U.S.A., United States of America.
U.S.S.R., Union of Soviet Socialist Republics.
ut sup. (L. *ut supra*), As above.

V.A.D., Voluntary Aid Detachment.
V.C., Vice-Chairman, -Chancellor, *or* -Consul; Victoria Cross.
Ven., Venerable.
verb sap., or **sat.** [L. *verbum satis sapienti*], A word is enough for a wise man.
Visct., Viscount, Viscountess.
viz., [L. *videlicet*], Namely.
V.R. [L. *Victoria Regina*], Queen Victoria.
V.R. et I. [L. *Victoria Regina et Imperatrix*], Victoria Queen and Empress.
V.S., Veterinary Surgeon.

W., West; western.
W.A.A.C., Woman's Army Auxiliary Corps.
W.A.A.F., Women's Auxiliary Air Force.
W.C., Western Central, London postal district.
w.f., (*Print*). Wrong fount.
W.I., West Indies.
Winton. (L. *Wintoniensis*), Of Winchester (the Bishop of Winchester's signature).
Wm., William.
W.N.W., West-north-west.
W.O., War Office.
W.P.B., Waste-paper basket
W.R.N.S., Woman's Royal Naval Service.
W.S., Writer to the Signet.
W.S.W., West-south-west

x.d., Ex (without) dividend.
Xmas., Christmas.
Xn., Christian.
Xt., Christ.

yd., yard.
Y.M.C.A., Young Men's Christian Association.
Y.M.Cath.A., Young Men's Catholic Association.
yr., Year; your.
Y.W.C.A., Young Women's Christian Association.

Zool., Zoological.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FOREIGN PHRASES AND WORDS IN ENGLISH USE

à bas [F.]. Down down with!
ab initio [L.]. From the beginning.
ab origine [L.]. From the commencement.
ab ova [L.]. From the egg, from the beginning.
absit omen. Let there be no ill omen.
ab urbe condita or **A.U.C.** [L.]. From the building of the city (Rome), 754 B.C.
ad astra [L.]. To the stars.
ad captandum vulgus [L.]. To attract or please the rabble.
à demi [F.]. By halves.
ad hoc [L.]. Specially.
ad infinitum [L.]. To infinity.
ad nauseam (L.). To the point of nausea.
ad rem [L.]. To the point.
adsum [L.]. I am present.
ad valorem [L.]. According to value.
æquo animo [L.]. With a calm mind.
ætatis suæ [L.]. Of his (or her) age.
affaire d'honneur [F.]. An affair of honour, a duel.
à la [F.]. According to; in the style of.
à la carte [F.]. By the bill of fare.
à la mode [F.]. In fashion
al fresco [It.]. In the open air.
allons! [F.]. Come, let us be off!
Alma Mater [L. fostering mother]. One's school, college, or university.
alter ego [L.]. One's second self.
amende honorable [F.]. Public apology.
a mensa et thoro [L.]. From bed and board.
à merveille [F.]. Admirably, perfectly.
amour-propre [F.]. Self-esteem, vanity.
anno Domini [L.]. In the year of our Lord.
anno mundi [L.]. In the year of the world.
annus mirabilis [L.]. A year of wonders.
ante bellum [L.]. Before the war.
ante meridiem [L.]. Before noon.
à outrance [F.]. To the end.
arbiter elegantiarum. [L.]. A judge in matters of taste.
Arcades ambo [L.]. Two of similar tastes, etc.
argumentum ad hominem [L.]. An appeal to personal interests, etc.
ars longa, vita brevis [L.]. Art is long, life short.
artium magister [L.]. Master of Arts.
atra cura [L.]. Black care.
au contraire [F.]. On the contrary.
au courant de [F.]. Fully informed about.
audi alteram partem [L.]. Hear the other side.
au fait [F.]. Familiar.
au fond [F.]. At bottom.
au gratin [F.]. (Cooked) with breadcrumbs and grated cheese.
au naturel [F.]. In its natural state.
au pied de la lettre [F.]. Literally, precisely.
au revoir [F.]. Till we meet again.
aut Cæsar aut nullus [L.]. Either Cæsar or nobody.
aux armes! [F.]. To arms!
avant-propos [F.]. Preface.
ave atque vale [L.]. Hail! and farewell!
ave Imperator, morituri te salutant [L.]. Hail Emperor! Those who are about to die salute thee.

ballon d'essai [F.]. A feeler.
bavardage [F.]. Gossip.
beau sabreur [F.]. A dashing cavalryman.
beaux esprits [F.]. Men of wit.
beaux yeux. [F.]. Fine eyes, good looks.
ben trovato [It.]. Well invented.
bête noire [F.]. One's aversion.
bien aimé [F.]. (fem. **aimée**). Well-beloved.
bis dat qui cito dat [L.]. He gives twice who gives speedily.
blague [F.]. Humbug.
bona fide [L.]. In good faith.
bonjour [F.]. Good day.
bon mot [F.]. A witty saying.
bonne [F.]. A nurse-maid.
bonne-bouche [F.]. A dainty morsel.
bonsoir [F.]. Good evening.
bon ton [F.]. Fashion, good style.
bon vivant [F.]. One fond of good living.
bon voyage [F.]. A pleasant journey, farewell.

ça ira [F.]. That's the thing.
canaille [F.]. The rabble.
carpe diem [L.]. Enjoy the day.
casus belli [L.]. A ground of war.
cause célèbre [F.]. A notable case or trial.
cave canem [L.]. Beware of the dog.
cead mile failte [Ir.]. A hundred thousand welcomes.
cela va sans dire [F.]. That goes without saying.
c'est-à-dire [F.]. That is to say.
cetera desunt [L.]. The rest are wanting.
ceteris paribus [L.]. Other things being equal.
chacun à son goût (F.). Everyone to his taste.
chef-d'œuvre [F.]. A masterpiece.
ci-devant [F.]. Formerly.
circa [L.]. About.
comme il faut [F.]. Correct.
communiqué [F.]. An official report.
compos mentis [L.]. Sound of mind.
consummatum est [L.]. It is finished.
corpus delicti [L.]. The substance of the offence.
corpus vile [L.]. Worthless matter.
coup de grâce [F.]. A finishing stroke.
coup d'Etat [F.]. A sudden change of government.
crème de la crème [F.]. The very best.
cui bono? [L.]. For whose advantage?
cum grano salis [L.]. With a grain of salt.

de facto [L.]. In reality, actually.
de gustibus non est disputandum [L.]. There is no disputing about tastes.
de haut en bas [F.]. Contemptuously.
Dei gratia [L.]. By the grace of God.
de jure [L.]. By right.
delineavit [L.]. He (or she) drew it.
de luxe [F.]. Luxurious.
de mortuis nil nisi bonum [L.]. Let nothing be said of the dead but what is good.
de novo [L.]. Anew.
Deo gratias [L.]. Thanks be to God.
de omnibus rebus [L.]. Concerning all things.
Deo volente [L.]. God willing.
de rigueur [F.]. According to strict etiquette.
dernier ressort [F.]. A last resource.
de trop [F.]. Superfluous.
Deus vobiscum [L.]. God be with you.
Dieu et mon droit [F.]. God and my right.
dis aliter visum [L.]. The Gods have decided otherwise.
disjecta membra [L.]. Scattered remains.
divide et impera [L.]. Divide and govern.
doctor utriusque legis [L.]. Doctor of both laws (i.e. canon and civil).
dolce far niente [It.]. Sweet idleness.
dulce, domum [L.]. Sweet is the strain of "Homeward."

ecce homo [L.]. Behold the man!
ecce signum [L.]. Behold the proof.
édition de luxe [F.]. A sumptuous edition.
editio princeps [L.]. A first printed edition.
ejusdem generis [L.]. Of the same kind.
embarras de richesse [F.]. A superfluity of anything wanted or desirable.
en avant [F.]. Forward.
en bloc [F.]. In the mass.
en déshabillé [F.]. In undress.
en famille [F.]. At home.
enfants perdus [F.]. A forlorn hope.
enfant terrible [F.]. A precocious youngster.
en masse [F.]. In a body.
en passant [F.]. By the way.
en pension [F.]. On boarding-house terms.
en route [F.]. On the way

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

en suite [F.]. In a set, in succession.
entente cordiale [F.]. A good understanding.
entre nous [F.]. Between ourselves, in confidence.
esprit de corps [F.]. Pride in one's school, etc.
esse quam videri [L.]. To be rather than to seem.
est modus in rebus [L.]. There is a middle course in all things.
et id genus omne [L.]. And everything of the sort.
et tu Brute! [L.]. And thou, too, Brutus (the last words of Cæsar).
ex animo [L.]. Heartily, sincerely.
ex cathedra [L.]. With authority.
exempli gratia [L.]. By way of example.
exeunt omnes [L.]. All go out.
ex gratia [L.]. As an act of favour.
ex mero motu [L.]. Of his own free will.
ex officio [L.]. By virtue of one's office.
ex parte [L.]. From one side only.
experientia docet [L.]. Experience teaches.
experto crede [L.]. Believe one who has tried it.
ex post facto [L.]. After the deed is done.
ex tempore [L.]. At the time, off-hand.

facile princeps [L.]. The acknowledged chief.
facilis descensus Averno [L.]. The descent to hell is easy.
façon de parler [F.]. Manner of speaking.
fait accompli [F.]. An accomplished fact.
faute de mieux [F.]. In default of something better.
faux pas [F.]. A blunder, a slip.
fecit [L.]. He (or she) made or drew it.
festina lente [L.]. Don't be impetuous.
fiat lux [L.]. Let there be light.
fidei defensor [L.]. Defender of the faith.
fidus Achates [L.]. A true friend.
flagrante delicto [L.]. In the very act.
floreat [L.]. May (it) flourish.
force majeure [F.]. Superior power.

gage d'amour [F.]. A love-token.
gaudeamus igitur [L.]. Therefore, let us rejoice.
gens de lettres [F.]. Literary men.
gloria in excelsis Deo [L.]. Glory to God in the highest.
grande passion [F.]. A serious love-affair.
guerra al cuchillo [Sp.]. War to the knife

hinc illæ lacrimæ [L.]. Hence these tears.
hoc genus omne [L.]. All this sort of (people, etc.).
homme d'esprit [F.]. A wit, a genius.
honi soit qui mal y pense [F.]. Shame be to him who thinks evil of it (motto of the Order of the Garter).
honoris causa [L.]. For the sake of honour.
horresco referens [L.]. I shudder as I tell the story.
horribile dictu [L.]. Horrible to tell.
hors de combat [F.]. Disabled.

ich dien [G.]. I serve (Prince of Wales's motto).
ici on parle français [F.]. French is spoken here.
ignoratio elenchi [L.]. Ignoring the point in dispute.
in camera [L.]. In the judge's chamber, not in open court.
in extenso [L.]. At full length.
in extremis [L.]. At the point of death.
in flagrante delicto [L.]. In the very act.
in forma pauperis [L.]. As a pauper.
infra dignitatem (infra dig.) [L.]. Beneath one's dignity.
in loco parentis [L.]. In the place of a parent.
in medias res [L.]. Into the very midst of the business.
in memoriam [L.]. To the memory of.
in propria persona [L.]. In one's own person.
in re [L.]. In the matter of.
in situ [L.]. In position.
in status quo [L.]. In the same state as.
inter alia [L.]. Among other things.
invenit [L.]. He (or she) devised this.
ipsissima verba [L.]. The identical words.
ipso facto [L.]. By the fact itself.

jam satis! [L.]. Enough now of this!
jeune premier [F.]. A stage lover.
jeunesse dorée [F.]. The gilded youth.
jus gentium [L.]. The law of nations.
juste milieu [F.]. The golden mean.
j'y suis et j'y reste [F.]. Here I am and here I stay.

laborare est orare [L.]. To work is to pray.
lapsus calami (linguæ, memoriæ) [L.]. A slip of the pen (tongue, memory).
lares et penates [L.]. Household gods.
le beau monde [F.]. The world of fashion, society.
les convenances [F.]. The proprieties.
le tout ensemble [F.]. The general effect.
lex talionis [L.]. The law of retaliation.
licet [L.]. It is legal.
lite pendente [L.]. During the trial.
loco citato [L.]. In the place quoted.
locus standi [L.]. Recognized position authorizing appearance in court, etc.
loquitur [L.]. He (or she) speaks.
lusus naturæ [L.]. A freak of nature.

ma chère [F.]. My dear (fem.).
magnum bonum [L.]. A great good.
magnum opus [L.]. The great work of a man's life.
maître d'hôtel [F.]. A hotel manager.
mauvaise honte [F.]. False shame.
mauvais sujet [F.]. A worthless fellow.
mauvais ton [F.]. Bad style.
mea culpa [L.]. By my fault.
me judice [L.]. In my opinion.
mens sana in corpore sano [L.]. A sound mind in a sound body.
merum sal [L.]. Pure salt, true wit.
meum et tuum [L.]. Mine and thine.
mirabile dictu [L.]. Wonderful to relate.
miserere mei [L.]. Have mercy upon me.
mon cher [F.]. My dear (masc.).
motu proprio [L.]. Of his own accord.
multum in parvo [L.]. Much in little.
mutatis mutandis [L.]. The necessary changes being made.

nemine contradicente [L.]. No one contradicting.
nemine dissentiente [L.]. No one dissenting.
ne plus ultra [L.]. Perfection.
nil admirari [L.]. To be astonished at nothing.
nil desperandum [L.]. Never despair.
noblesse oblige [F.]. Rank imposes obligations.
nolle prosequi [L.]. To be unwilling to prosecute.
non compos mentis [L.]. Not of sound mind.
non nobis [L.]. Not unto us
non obstante [L.]. Notwithstanding.
non sequitur [L.]. It does not follow.
nosce teipsum [L.]. Know thyself.
nota bene [L.]. Note well.
nous avons changé tout cela [F.]. We have changed all that.
nous verrons [F.]. We shall see.
nouveau riche [F.]. (pl. **nouveaux riches**). A newly-rich man.

obiit [L.]. He (or she) died.
odium theologicum [L.]. Hatred among theologians.
œuvres [F.]. Works.
operæ citato [L.]. In the work cited.
ora pro nobis [L.]. Pray for us.
O tempora! O mores! [L.]. Alas for the times and the manners!

pace [L.]. By leave of, with the consent of.
panem et circenses [L.]. Food and amusement.
par excellence [F.]. Pre-eminently.
pari passu [L.]. At the same rate or pace.
pas de deux [F.]. dance for two.
pas seul [F.]. A dance for one.
pax vobiscum. [L.] Peace be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

with you.
per contra [L.]. On the other hand.
per se [L.]. By itself.
persona grata [L.]. An acceptable person.
pièce de résistance [F.]. The most substantial dish at a meal.
pied-à-terre [F.]. A temporary lodging.
pis aller [F.]. A makeshift.
point d'appui [F.]. A base for action.
post obitum [L.]. After death.
pour encourager les autres [F.]. To encourage the others.
pour prendre congé (P.P.C.) [F.]. To take leave.
prima facie [L.]. At first sight.
pro bono publico [L.]. For the public good.
pro forma [L.]. As a matter of form.
proprio motu [L.]. Of one's own accord.
pro rata [L.]. In proportion.
pro tempore [L.]. For the time being.
proxime accessit [L.]. He (or she) came nearest.

quæ vide [L.]. Which (things) see.
quantum libet [L.]. As much as you like.
que voulez-vous? [F.]. What would you have?
quid pro quo [L.]. Something in return.
qu'importe? [F.]. What does it matter?
qui s'excuse, s'accuse [F.]. He who excuses himself accuses himself.
quis separabit? [L.]. Who shall separate us?
qui va là? [F.]. Who goes there?
quod erat demonstrandum (Q.E.D.) [L.]. Which was to be proved.
quod erat faciendum (Q.E.F.) [L.]. Which was to be done.
quod vide [L.]. Which (thing) see.
quot homines, tot sententiæ [L.] There are as many opinions as there are men.
quo vadis? [L.]. Whither goest thou?

raison d'être [F.]. The reason for a thing's existence.
rara avis [L.]. A rare bird; a prodigy.
reductio ad absurdum [L.]. Proof by demonstrating the absurdity of the contrary.
re infecta [L.]. With the business unfinished.
répondez s'il vous plaît (R.S.V.P.) [F.]. Please reply.
requiescat in pace [L.]. May he rest in peace.
resurgam [L.]. I shall rise again.
revenons à nos moutons [F.]. Let us come back to our subject.
ruat cælum [L.]. Let the heavens fall.
rus in urbe [L.]. Country in town.

sans pareil [F.]. Unequalled.
sans souci [F.]. Free from care.
sauve qui peut [F.]. Save yourselves who can.
savoir faire [F.]. Tact; skill.
savoir vivre [F.]. Good breeding.
seniores priores [L.]. Those who are older first.
sic transit gloria mundi [L.]. So earthly glory passes away.
s'il vous plaît [F.]. If you please.
sine die [L.]. Without any day (being fixed).
sine qua non [L.]. An indispensable condition.
statim [L.]. At once.
status quo ante [L.]. The same state as before.
Sturm und Drang [G.]. Storm and stress.
suaviter in modo, fortiter in re [L.]. Gently in manner, but powerfully in reality.
sub judice [L.]. Under consideration.
sub rosa [L.]. Confidentially.
sub silentio (L.). Without notice being taken.
succès d'estime [F.]. A success with more credit than profit.
sui generis [L.]. Of its (his, or her) own kind.
sui juris [L.]. Of his (or her) own right.
sursum corda [L.]. Lift up your hearts.
tempora mutantur, nos et mutamur in illis [L.]. The times are changed and we with them.
tempus fugit [L.]. Time flies.
terra incognita [L.]. An unknown land.
tertium quid [L.]. A third something.
testis unus, testis nullus [L.]. One witness (or piece of evidence (of), no evidence.
timeo Danaos et dona ferentes [L.]. I fear the Greeks when they offer gifts.
toties quoties [L.]. As often as.
toujours perdrix [F.]. Too much of a good thing.
tour de force [F.]. A feat of strength or skill.
tout de suite [F.]. Immediately.
tout ensemble [F.]. The general effect.
Troja fuit [L.]. Troy has perished.
tu quoque [L.]. You also.

ubique [L.]. Everywhere.
ultra vires [L.]. Beyond one's (legal) powers.
urbi et orbi [L.]. To the city and the world.
ut supra [L.]. As (mentioned) above.

varia lectio [L.]. (pl. **variæ lectiones**). A variant reading.
veni, vidi, vici [L.]. I came, I saw, I conquered.
verbatim et literatim [L.]. Word for word and letter for letter.
verbum satis sapienti [L.]. A word is enough to the wise.
via media [L.]. A middle course.
vi et armis [L.]. By force and arms.
virginibus puerisque [L.]. For maidens and boys.
vita brevis, ars longa [L.]. Life is short, but art is long.
vivat rex (regina)! [L.]. Long live the king (queen)!
vive la République! [F.]. Long live the Republic!
vive l'empereur! [F.]. Long live the Emperor!
vogue la galère [F.]. Happen what may.
voilà [F.]. See there, there it is.
voilà tout [F.]. That's all.
vox et præterea nihil [L.]. A voice and nothing more.
vox (pl. **voces**) **populi** [L.]. The voice of the people, popular feeling.
vox populi vox Dei [L.]. The voice of the people is the voice of God.

Weltschmerz [G.]. Pessimism

Zeitgeist [G.]. The spirit of the age.

TIME IN DIFFERENT PLACES

Standard time has been adopted for railways and other general purposes in most countries. In general, this means that the same time is used for belts of 15° longitude in width. For example, from 7½° E. of Greenwich to 22½° E. of Greenwich, the time is the same and is that proper to 15° E. of Greenwich (Mid-European time). For geographical reasons the 15° limit is not quite rigidly adhered to in some instances.

Greenwich time is standard time in Belgium, France, Gibraltar, and Spain. **Holland** is 20 minutes fast.

Mid-European time (1 hour fast of Greenwich) is standard time in Austria, Denmark, Germany, Hungary, Italy, Norway, Sweden, Switzerland, and part of Turkey.

East European time (2 hours fast of Greenwich) in Bulgaria, Rumania, and part of Turkey. Russia adopts Leningrad time, which is one minute faster.

Eastern American, 75° W. (5 hours slow of Greenwich), includes Boston, Montreal, New York, Quebec, Toronto, Washington.

Central American, 90° W. (6 hours slow of Greenwich), includes Chicago, Detroit, New Orleans, Winnipeg; also the six republics of Central America and part of Mexico.

Mountain, 105° W. (7 hours slow of Greenwich), includes Denver and Regina.

Pacific, 120° W. (8 hours slow of Greenwich), includes British Columbia and San Francisco.

West Australia, Borneo and **Hongkong** are 8 hours fast; **Japan** and **Korea** are 9 hours fast; **South Australia** is 9½ hours fast; **New South Wales, Queensland, Tasmania** and **Victoria** are 10 hours fast; **New Zealand** is 11½ hours fast; **India** is 5½ hours fast.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CONVERSION TABLES

Table for Converting Decimals of a Pound into Shillings, Pence, and Farthings.

£	s.	d.	£	s.	d.	£	s.	d.
·1	2	0	·01	0	2½	·001	0	0¼
·2	4	0	·02	0	4½	·002	0	0½
·3	6	0	·03	0	7¼	·003	0	0¾
·4	8	0	·04	0	9½	·004	0	1
·5	10	0	·05	1	0	·005	0	1¼
·6	12	0	·06	1	2½	·006	0	1½
·7	14	0	·07	1	4½	·007	0	1¾
·8	16	0	·08	1	7¼	·008	0	2
·9	18	0	·09	1	9½	·009	0	2¼

Table for Converting Shillings, Pence, and Farthings into Decimals of a Pound

At	Dec. of £1	Amt.	Dec. of £1	Amt.	Dec. of £1	Amt.	Dec. of £1
d.		s. d.		s. d.		s. d.	
0¼	·0010	0 7½	·0312	5 0	·2500	13 0	·6500
0½	·0021	0 8	·0333	6 0	·3000	13 9	·6875
0¾	·0031	0 9	·0375	6 3	·3125	14 0	·7000
1	·0042	0 10	·0417	7 0	·3500	15 0	·7500
2	·0083	0 10½	·0437	7 6	·3750	16 0	·8000
2¼	·0104	0 11	·0458	8 0	·4000	16 3	·8125
3	·0125	1 0	·0500	8 9	·4375	17 0	·8500
3¼	·0156	1 3	·0625	9 0	·4500	17 6	·8750
4	·0167	1 6	·0750	10 0	·5000	18 0	·9000
4½	·0187	2 0	·1000	10 6	·5250	18 9	·9375
5	·0208	2 6	·1250	11 0	·5500	19 0	·9500
6	·0250	3 0	·1500	11 3	·5625	20 0	1·0000
6¼	·0271	3 9	·1875	12 0	·6000	21 0	1·0500
7	·0292	4 0	·2000	12 6	·6250	31 6	1·5750

CAPACITY. Minims, Fluid Ounces, Pints, etc., Fluid and Grain Measure, etc., Bushels, etc., Cubic Inch, Foot and Yard, into Cubic Centimetres, Litres, etc.

Mnms	Cub. Cm.	Drms. Ozs.	Cub. Cm.	Pints Gals.	Litres	Bshels, Qrts.	Hecto litres
½	·03	1 dr.	3·6	½ pt.	·284	½ bus.	18
1	·059	2 ,,	7·1	1 ,,	·567	1 ,,	·36
2	·118	3 ,,	10·6	2 ,,	1·135	2 ,,	·73
3	·178	4 ,,	14·2	3 ,,	1·703	3 ,,	1·09
4	·237	5 ,,	17·7	4 ,,	2·270	4 ,,	1·45
5	·296	6 ,,	21·3	1 gal.	4·5	8 ,,	2·91
6	·355	7 ,,	24·8	2 ,,	9·1	2 qrts.	5·82
7	·414	8 ,,	28·4	3 ,,	13·6	3 ,,	8·73
8	·474	2 fl. oz.	56·8	4 ,,	18·2	4 ,,	11·63
9	·533	3 ,,	85·2	5 ,,	22·7	5 ,,	14·54
10	·592	4 ,,	113·6	9 ,,	40·9	8 ,,	23·27
15	·888	5 ,,	142·1	36 ,,	163·6	10 ,,	29·08

1 Cubic inch = 16·3862 c.cm. 1 Cubic foot = 28·3153 Litres. 1 Cubic yard = ·7646 Cubic Metres.

CAPACITY. Cubic Centimetres, Litres and Hectolitres, into Fluid Measure, Bushels and Cubic Feet and Inches.

Cubic Cm.	Fluid Measure	Cubic Inches	Litres	Impl. Pints	Hecto-litres	Impl. Bushs.	Cub. Feet
	Minims				1	2¾	3·53
1	16·9	·0610	1	1¾	2	5½	7·06
2	33·8	·1220	2	3½	3	8¼	10·59
3	50·7	·1831	3	5¼	4	11	14·13
	drs. mns.		4	7	5	13¾	17·66
4	1 8	·2441	5	8¾	6	16½	21·19
5	1 25	·3051	6	10½	7	19¼	24·72
6	1 41	·3661	7	12¼	8	22	28·25
7	1 58	·4271	8	14	9	24¾	31·78
8	2 15	·4882	9	15¾	10	27½	35·32
9	2 32	·5492	10	17½	15	41¼	52·98
10	2 49	·6102	15	26⅜			

1 Litre = ·2200967 Gallons = 1.7607736 Pints.

TABLES FOR CONVERSION BETWEEN ENGLISH WEIGHTS AND MEASURES AND THE METRIC SYSTEM

WEIGHT. Grains, Ounces, Pounds (Troy and Avoirdupois), etc., into Grammes, Kilogrammes, etc.

Grns.	Grms.	Grns.	Grms.	Troy wt.	Grms.	Avds. wt.	Grms.
						½ oz.	14·17
½	·032	15	·972	1 dwt.	1·555	1 ,,	28·35
1	·065	20	1·296	2 ,,	3·110	2 ,,	56·70
2	·130	25	1·620	3 ,,	4·665	3 ,,	85·05
3	·194	30	1·944	4 ,,	6·221	5 ,,	141·75
4	·259	40	2·592	5 ,,	7·776	8 ,,	226·80
5	·324	50	3·240	10 ,,	15·552	1 lb.	453·59
6	·389	60	3·888	1 oz.	31·104	2 ,,	907·19
7	·454	70	4·536	2 ,,	62·207		kilo.
8	·519	80	5·184	3 ,,	93·311	3 ,,	1·361
9	·583	90	5·832	4 ,,	124·414	4 ,,	1·814
10	·648	100	6·480	5 ,,	155·517	5 ,,	2·268
				½ lb.	186·621	6 ,,	2·722

Avoirdupois.

lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	ton
7	8	9	10	14	28	56	112	1

Kilogrammes.

3·175 | 3·629 | 4·082 | 4·536 | 6·350 | 12·7 | 25·4 | 50·8 | 1016·6

The equivalents of 20, 30, 40, etc., lb. appear at once by moving the decimal point one place to the right in the equivalents of 2, 3, 4, etc., lb.

WEIGHT. Grammes or Kilos, etc., into Grains and Ounces, Pounds, etc., Avoirdupois.

Milg. etc.	Grns.	Grn.	Grains	Grn.	Grns. Ozs.	Grms. etc.	lb., etc.
Milg.		1	15·432		Grains	Grms.	lb. (Avi. 2.2046
1	·015	2	30·865	17	262·365	1000	2.2046
2	·031	3	46·297	20	308·6	Kilos	lb. oz.
3	·046	4	61·729	25	385·763	2	4 6¼
4	·061	5	77·162	30	463	3	6 9
5	·077	6	92·594	40	617	4	8 13½
Cntg.		7	108·026	45	694.162	5	11 0¼
1	·154	8	123·459	50	771	10	22 0¾
2	·309	9	138·891		ozs. (av)	50	110 3¾
3	·463	10	154·323	100	3½	100(a)	220 7½
5	·772	11	169·755	200	7	500	1102 5
		12	185·188	250	8¾	750	1653 7½
Dcg.						1000(b)	2204 10
1	1·543	13	200·620	300	10½	Milliers	Tn. ct. lb.
2	3·086	14	216·052	350	12⅓	5	4 18 47½
3	4·630	15	231·485	400	14	100	98 8 46
5	7·716	16	246·932	500	17½		

(a) 100 Kilogrammes = 1 Quintal.
(b) 1,000 Kilogrammes = 1 Millier, or Metric Ton.

The equivalents of 20, 30, 40, etc., lb. appear at once by moving the decimal point one place to the right in the equivalents of 2, 3, 4, etc., lb.

LENGTH. Millimetres, Metres, Kilometres, etc., into Inches, Feet, Miles, etc.

Milli-metres, etc.	Ins	D M	Feet, Ins.	Mt.	Yards, Feet, Inches	Mtr.	Yards, etc.
					yds. ft. in.	500	546 2 5½
mm.			Ins.		yds. ft. in.	1000	1093 1 10¾
1	·04	2	7⅞	15	16 1 2½	(1k)	
2	·08	3	11	20	21 2 7½	Klm.	Miles Yds.
3	·12	4	15¾	25	27 0 1¾	2	1 427
5	·20	5	19¾	30	32 2 5¼	3	1 1521
10(1cm.)	·39	M	ft. ins.	35	38 0 10¾	4	2 854
Ctmrs.		1	3 3¾	40	43 2 2¼	5	3 188
2	·79	2	6 6¾	50	54 2 0¾	10	6 376
3	1·18	3	9 10¼	100	109 1 1½	20	12 753
4	1·57	4	13 1¾	200	218 2 2¾	50	31 122
5	1·97	5	16 4¾	300	328 0 3¼	100	62 243
10 (1dm)	3·94	10	32 9⅝	400	437 1 4½		

1 Metre = 39·3707904 inches.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LENGTH. Inches, Feet, Miles, etc., into Metres, etc.

In	Milli.	Feet	Mtrs.	Yards	Metres	Ml's	Kilo.
½	12·70	1	·3048	5	4·5719	2	3·22
1	25·40	2	·6096	6	5·4863	3	4·83
2	50·80	3 (1 yd.)	·9144	7	6·4007	4	6·44
3	76·20	4	1·2192	8	7·3151	5	8·05
4	101·60	5	1·5240	9	8·2294	6	9·66
5	127·00	6 (2 yd.)	1·8288	10	9·1438	7	11·27
6	152·40	7	2·1336	12	10·9726	8	12·87
7	177·80	8	2·4384	220	201·2	9	14·48
8	203·20	9 (3 yd.)	2·7432	440	402·3	10	16·09
9	228·60	10	3·0479	880	804·7	11	17·70
10	253·99	11	3·3527	1320	1207·0	12	91·31
11	279·39	12 (4 yd.)	3·6575	1760(m)	1609·3	1NM	1·855

The equivalents of 20, 30, 40, etc., inches, feet, yards or miles appear at once by moving the decimal point one place to the right in the equivalents of 2, 3, 4, etc. The equivalents of the hundreds can be found from the corresponding units by moving the decimal point a second place to the right.

Table for Converting Cwts., Qtrs. and Pounds into Decimals of a Ton.

lb.	Dec. of Ton	lb.	Dec. of Ton	lb.	Dec. of Ton	Cwt.	Dec. of Ton
0½	·0001	17	·0076	60	·0268	2	·1000
0½	·0002	18	·0080	**70**	**·0312**	3	·1500
1	·0004	19	·0085	80	·0367	4	·2000
2	·0009	20	·0089	**84**	**·0375**	5	·2500
3	·0013	21	·0094	90	·0402	6	·3000
4	·0018	22	·0098	**98**	**·0437**	7	·3500
5	·0022	23	·0102	100	·0446	8	·4000
6	·0027	24	·0107	110	·0491	9	·4500
7	·0031	25	·0111	**112**	**·0500**	10	·5000
8	·0036	26	·0116	150	·0670	11	·5500
9	·0040	27	·0120	200	·0893	12	·6000
10	·0045	**28**	**·0125**	300	·1339	13	·6500
11	·0049	29	·0129	400	·1786	14	·7000
12	·0054	30	·0134	500	·2232	15	·7500
13	·0058	40	·0179	600	·2679	16	·8000
14	**·0062**	**42**	**·0187**	700	·3125	17	·8500
15	·0067	50	·0223	800	·3571	18	·9000
16	·0071	**56**	**·0250**	1000	·4464	19	·9500

Corresponding Temperatures Fahrenheit and Centigrade.

F.	C.	F.	C.	F.	C.	F.	C.
—40	—40	59	15	101·5	38·6	122	50
—31	—35	68	20	102	38·9 (*e*)	212	100
—22	—30	77	25	102·5	39·2 (*f*)	455	235
—13	—25	86	30	103	39·4 (*g*)	509	265
— 4	—20	95	35	103·5	39·7 (*h*)	633	334
0	—17·8	96·8	36 (*c*)	104	40 (*i*)	773	412
+ 5	—15	(*b*)98·4	36·9	104·5	40·3 (*j*)	809	432
+14	—10	99	37·2	105	40·6 (*k*)	1292	700
+23	— 5	99·5	37·5	106	41·1 (*l*)	1742	950
(*a*)+32	0	100	37·8	107	41·7 (*m*)	2012	1100
41	5	100·5	38·1	108	42·2 (*n*)	2764	1240
50	10	101	38·3 (*d*)	110	43·3 (*o*)	2732	1500

(*a*) Freezing point of pure water. (*b*) Normal temperature of the human body. (*c*) Very high body temperature. (*d*) In most cases a fatal body temperature. (*e*) Boiling point of water under ordinary atmospheric pressure. Melting point of metals: (*f*) tin, (*g*) bismuth, (*h*) lead, (*i*) zinc, (*j*) antimony, (*k*) aluminium, (*l*) silver, (*m*) copper, (*n*) gold, (*o*) wrought iron. The authority followed for the above figures is Phillips and Bauerman's *Elements of Metallurgy*.

To convert any number of degrees Fahrenheit into Centigrade, first deduct 32, then multiply the remainder by 5 and divide by 9.

To convert a number of degrees Centigrade into degrees Fahrenheit, multiply by 9, divide by 5, and add 32.

Table for Converting Miles per Hour into Yards per Minute or Feet per Second.

Miles per Hour	Yards per Minute	Feet per Second	Miles per Hour	Yards per Minute	Feet per Second
1	29⅓	1⅞	16	469⅓	23⅓
2	58⅔	2⅞	17	498⅔	24⅞
3	88	4⅜	18	528	26⅜
4	117⅓	5⅞	19	557⅓	27⅞
5	146⅔	7⅓	20	586⅔	29⅓
6	176	8⅞	25	733⅓	36⅔
7	205⅓	10⅓	30	880	44
8	234⅔	11⅞	35	1026⅔	51½
9	264	13⅜	40	1173⅓	58⅔
10	293⅓	14⅔	45	1320	66
11	322⅔	16⅛	50	1466⅔	73⅓
12	362	17⅝	55	1613⅓	80¾
13	381⅓	19⅛	60	1760	88
14	410⅔	20½	80	2346⅔	117½
15	440	22	100	2933⅓	146⅔

Table Showing the Value per Month, Week, or Day of a stated number of Pounds per Year.

Pr.Yr.	10s.	£1	£2	£3	£4
	d.	s. d.	s. d.	s. d.	s. d.
„Mth.	10	1 8	3 4	5 0	6 8
„Wk.	2½	0 4½	0 9½	1 1½	1 6½
„Day	0½	0 0½	0 1½	0 2	0 2½

Pr.Yr.	£5	£6	£7	£8	£9
	s. d.	s. d.	s. d.	s. d.	s. d.
„Mth.	8 4	10 0	11 8	13 4	15 0
„Wk.	1 11	2 3½	2 8½	3 0½	3 5½
„Day	0 3½	0 4	0 4½	0 5½	0 6

Pr.Yr.	£10	£11	£12	£13	£14
	s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	16 8	18 4	1 0 0	1 1 8	1 3 4
„Wk.	3 10	4 2½	0 4 7½	0 4 11½	0 5 4½
„Day	0 6½	0 7½	0 0 8	0 0 8½	0 0 9½

Pr.Yr.	£15	£16	£17	£18	£19
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	1 5 0	1 6 8	1 8 4	1 10 0	1 11 8
„Wk.	0 5 9	0 6 1½	0 6 6½	0 6 10½	0 7 3½
„Day	0 0 9½	0 0 10½	0 0 11½	0 0 11½	0 1 0½

Pr.Yr.	£20	£21	£22	£23	£24
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	1 13 4	1 15 0	1 16 8	1 18 4	2 0 0
„Wk.	0 7 8	0 8 0½	0 8 5½	0 8 9½	0 9 2½
„Day	0 1 1½	0 1 1½	0 1 2½	0 1 3	0 1 3½

Pr.Yr.	£25	£30	£35	£40	£45
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	2 1 8	2 10 0	2 18 4	3 6 8	3 15 0
„Wk.	0 9 7	0 11 6	0 13 5	0 15 4	0 17 3
„Day	0 1 4½	0 1 7½	0 1 11	0 2 2½	0 2 5½

Pr.Yr.	£50	£55	£60	£70	£80
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	4 3 4	4 11 8	5 0 0	5 16 8	6 13 4
„Wk.	0 19 2½	1 1 1½	1 3 0½	1 6 10½	1 10 8½
„Day	0 2 9	0 3 0½	0 3 3½	0 3 10	0 4 4½

Pr.Yr.	£90	£100	£150	£200	£250
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	7 10 0	8 6 8	12 10 0	16 13 4	20 16 8
„Wk.	1 14 6½	1 18 4½	2 17 6½	3 16 8½	4 15 10½
„Day	0 4 11½	0 5 5½	0 8 2½	0 10 11½	0 13 8½

An easy rule for converting money into the decimal of a pound is as follows: Every shilling is ·05, sixpence is ·025, and every farthing of the remainder is ·001, but if the remainder is threepence or over, ·001 must be added. For example, 6s. 4½d. = (6 × ·05) + (19 × ·001) = ·3 + ·019 + ·001 = ·320 of a pound

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DISCOUNT (AND PROFIT ON COST) TABLES

The following Tables show the percentage on any sum from one farthing to hundreds of pounds. Up to, and including, 3¾%, the results are given to the nearest farthing (half a farthing counts as a farthing); up to 17½%, to the nearest halfpenny; and up to 33¼%, to the nearest penny.

To find the discount or the profit on any amount below a pound, if the amount is not stated in the table, find the two consecutive amounts between which it falls and take the result given for the smaller.

Example: What is the discount at 1¼% on £47 17 3½. The discount on £40 is 10/-, on £7 is 1/9, total discount for the pounds is 11/9; 17/3½ falls between 17/6 and 15/10. and the discount on the smaller of these is 2½d.; the total discount at 1¼% on £47 17 3½ is therefore 11/9+2½d.=11/11½.

1¼% Discount (or Profit) at 1¼. 1¼%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt	Dis.
s. d.	s. d.	£ s. d.	s. d.	£	s. d.	£	£ s. d.
0 0½	0 0	0 19 2	0 3	11	2 9	50	0 12 6
0 10	0 0½	—	—	12	3 0	60	0 15 0
2 6	0 0¾	1 0 0	0 3	13	3 3	70	0 17 6
4 2	0 0¾	2 0 0	0 6	14	3 6	80	1 0 0
5 10	0 1	3 0 0	0 9	15	3 9	90	1 2 6
7 6	0 1¼	4 0 0	0 1 0	16	4 0	100	1 5 0
9 2	0 1¾	5 0 0	0 1 3	17	4 3	200	2 10 0
10 10	0 1¾	6 0 0	0 1 6	18	4 6	250	3 2 6
12 6	0 2	7 0 0	0 1 9	19	4 9	300	3 15 0
14 2	0 2¼	8 0 0	0 2 0	20	5 0	400	5 0 0
15 10	0 2¼	9 0 0	0 2 3	30	7 6	500	6 5 0
17 6	0 2¾	10 0 0	0 2 6	40	10 0	800	10 0 0

2½% Discount (or Profit) at 2½. 2½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt	Dis.
s. d.	s. d.	£ s. d.	s. d.	£	s. d.	£	£ s. d.
0 0½	0 0	0 12 1	0 3¾	5	2 6	20	0 10 0
0 5	0 0½	0 12 11	0 4	6	3 0	30	0 15 0
1 3	0 0½	0 13 9	0 4½	7	3 6	40	1 0 0
2 1	0 0¾	0 14 7	0 4½	8	4 0	50	1 5 0
2 11	0 1	0 15 5	0 4½	9	4 6	60	1 10 0
3 9	0 1½	0 16 3	0 5	10	5 0	70	1 15 0
4 7	0 1½	0 17 1	0 5½	11	5 6	80	2 0 0
5 5	0 1½	0 17 11	0 5½	12	6 0	90	2 5 0
6 3	0 2	0 18 9	0 5¾	13	6 6	100	2 10 0
7 1	0 2½	0 19 7	0 6	14	7 0	200	5 0 0
7 11	0 2½	—	—	15	7 6	250	6 5 0
8 9	0 2¾	1 0 0	0 6	16	8 0	300	7 10 0
9 7	0 3	2 0 0	0 1 0	17	8 6	400	10 0 0
10 5	0 3½	3 0 0	0 1 6	18	9 0	500	12 10 0
11 3	0 3¾	4 0 0	0 2 0	19	9 6	800	20 0 0

3% Discount (or Profit) at 3. 3%

Amt.	Dis.	Amt.	Dis.	Amt	Dis.	Amt	Dis.
s. d.	d.	£ s. d.	s. d.	£	s. d.	£	£ s. d.
0 0½	0	0 12 2	0 4½	6	3 7½	60	1 16 0
0 4½	0½	0 12 10½	0 4½	7	4 2½	70	2 2 0
1 0½	0½	0 13 6½	0 5	8	4 9	80	2 8 0
1 9	0½	0 14 3	0 5½	9	5 4½	90	2 14 0
2 5½	1	0 14 11½	0 5½	10	6 0	100	3 0 0
3 1½	1½	0 15 7½	0 5½	11	6 7½	150	4 10 0
3 10	1½	0 16 4	0 6	12	7 3	200	6 0 0
4 6½	1½	0 17 0½	0 6½	13	7 9	250	7 10 0
5 2½	2	0 17 8½	0 6½	14	8 4½	300	9 0 0
5 11	2½	0 18 5	0 6½	15	9 0	400	12 0 0
6 7½	2½	0 19 1½	0 7	16	9 7½	500	15 0 0
7 3½	2½	0 19 9½	0 7½	17	10 2½	600	18 0 0
8 0	3	—	—	18	10 9½	700	21 0 0
8 8½	3½	1 0 0	0 7½	19	11 4½	800	24 0 0
9 4½	3½	2 0 0	0 1 2½	20	12 0	750	22 10 0
10 1	3½	3 0 0	0 1 9½	30	18 0	900	27 0 0
10 9½	4	4 0 0	0 2 4½	40	24 0	1000	30 0 0
11 5½	4½	5 0 0	0 3 0	50	30 0		

3¼% Discount (or Profit) at 3½. 3½%

Amt.	Dis	Amt.	Dis	Amt.			Dis.		Amt	Dis.		
s. d.	d.	s. d.	d.	£	s.	d.	s.	d.	£	£	s.	d.
0 0½	0	11 0½	4½	3	0	0	2	1½	30	1	1	0
0 3½	0½	11 7½	5	4	0	0	2	9½	35	1	4	6
0 11	0½	12 2½	5½	5	0	0	3	6	40	1	8	0
1 6	0¾	12 9½	5½	6	0	0	4	2½	45	1	11	6
2 1½	1	13 5	5½	7	0	0	4	10½	50	1	15	0
2 8½	1½	14 0	6	8	0	0	5	7½	60	2	2	0
3 3½	1½	14 7½	6½	9	0	0	6	3½	70	2	9	0
3 10½	1½	15 2½	6½	10	0	0	7	0	75	2	12	6
4 5½	2	15 9½	6½	11	0	0	7	8½	80	2	16	0
5 1	2¼	16 4½	7	12	0	0	8	4½	90	3	3	0
5 8	2½	16 11½	7¼	13	0	0	9	1½	100	3	10	0
6 3½	2¾	17 7	7½	14	0	0	9	9½	150	5	5	0
6 10½	3	18 2	7¾	15	0	0	10	6	200	7	0	0
7 5½	3¼	18 9½	8	16	0	0	11	2½	250	8	15	0
8 0½	3¼	19 4½	8¼	17	0	0	11	10½	300	10	10	0
8 7½	3¾	19 11½	8¾	18	0	0	12	7½	500	17	10	0
9 3	4	20 0	8¾	19	0	0	13	3½	600	21	0	0
9 10	4¼	40 0	16¼	20	0	0	14	0	700	24	10	0
10 5½	4½	—	—	25	0	0	17	6	800	28	0	0

3¾% Discount (or Profit) at 3¾. 3¾%

Amt.	Dis	Amt.	Dis	Amt.			Dis.		Amt	Dis.		
s. d.	d.	s. d.	d.	£	s.	d.	s.	d.	£	£	s.	d.
0 0½	0	11 4½	5½	5	0	0	3	9	26	0	19	6
0 3½	0½	11 11½	5½	6	0	0	4	6	27	1	0	3
0 10	0½	12 6	5½	7	0	0	5	3	28	1	1	0
1 4½	0½	13 0½	6	8	0	0	6	0	29	1	1	9
1 11½	1	13 7½	6½	9	0	0	6	9	30	1	2	6
2 6	1½	14 2	6½	10	0	0	7	6	35	1	16	3
3 0½	1½	14 8½	6½	11	0	0	8	3	40	1	10	0
3 7½	1½	15 3½	7	12	0	0	9	0	45	1	13	9
4 2	2	15 10	7½	13	0	0	9	9	50	1	17	6
4 8½	2½	16 4½	7½	14	0	0	10	6	55	2	1	3
5 3½	2½	16 11½	7¾	15	0	0	11	3	60	2	5	0
5 10	2½	17 6	8	16	0	0	12	0	70	2	12	6
6 4½	3	18 0½	8¼	17	0	0	12	9	80	3	0	0
6 11½	3½	18 7½	8½	18	0	0	13	6	90	3	7	6
7 6	3½	19 2	8½	19	0	0	14	3	100	3	15	0
8 0½	3½	19 8½	9	20	0	0	15	0	200	7	10	0
8 7½	4	—	—	21	0	0	15	9	300	11	5	0
9 2	4½	20 0	9	22	0	0	16	6	400	15	0	0
9 8½	4½	40 0	18	23	0	0	17	3	500	18	15	0
10 3½	4½	60 0	27	24	0	0	18	0	600	22	0	0
10 10	5	80 0	36	25	0	0	18	9	800	30	0	0

4% Discount (or Profit) at 4. 4%

Amt.	Dis	Amt.	Dis	Amt.			Dis.		Amt	Dis.		
s. d.	d.	s. d.	d.	£	s.	d.	s.	d.	£	£	s.	d.
0 0½	0	13 4½	6½	13	0	0	10	4½	39	1	11	2½
0 3½	0½	13 10½	6½	14	0	0	11	2½	40	1	12	0
0 9½	0½	14 5	7	15	0	0	12	0	45	1	16	0
1 3½	0½	14 11½	7½	16	0	0	12	9½	50	2	0	0
1 10	1	15 5½	7½	17	0	0	13	7½	55	2	4	0
2 4½	1½	15 11½	7½	18	0	0	14	4½	60	2	8	0
2 10½	1½	16 6	8	19	0	0	15	2½	65	2	12	0
3 4½	1½	17 0½	8¼	20	0	0	16	0	70	2	16	0
4 0	2	17 6½	8½	21	0	0	16	9½	75	3	0	0
4 6½	2½	18 0½	8½	22	0	0	17	7½	80	3	4	0
5 0½	2½	18 7	9	23	0	0	18	4½	85	3	8	0
5 6½	2½	19 1½	9½	24	0	0	19	2½	90	3	12	0
6 1	3	19 7½	9½	25	0	0	20	0	95	3	16	0
6 7½	3½	—	—	26	0	0	20	9½	100	4	0	0
7 1½	3½	20 0	9½	27	0	0	21	7½	125	5	0	0
7 7½	3½	40 0	19½	28	0	0	22	4½	150	6	0	0
8 2	4	60 0	28½	29	0	0	23	2½	175	7	0	0
8 8½	4½	80 0	38½	30	0	0	24	0	200	8	0	0
9 2½	4½	100 0	48	31	0	0	24	9½	250	10	0	0
9 8½	4½	120 0	57½	32	0	0	25	7½	300	12	0	0
10 3	5	140 0	67½	33	0	0	26	4½	400	16	0	0
10 9½	5½	160 0	76½	34	0	0	27	2½	500	20	0	0
11 3½	5½	180 0	86½	35	0	0	28	0	600	24	0	0
11 9½	5½	200 0	96	36	0	0	28	9½	700	28	0	0
12 4	6	220 0	105½	37	0	0	29	7½	800	32	0	0
12 10½	6½	240 0	115½	38	0	0	30	4½	900	36	0	0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LENGTH. Inches, Feet, Miles, etc., into Metres, etc.

In	Milli.	Feet	Mtrs.	Yards	Metres	Ml's	Kilo.
½	12·70	1	·3048	5	4·5719	2	3·22
1	25·40	2	·6096	6	5·4863	3	4·83
2	50·80	3 (1 yd.)	·9144	7	6·4007	4	6·44
3	76·20	4	1·2192	8	7·3151	5	8·05
4	101·60	5	1·5240	9	8·2294	6	9·66
5	127·00	6 (2 yd.)	1·8288	10	9·1438	7	11·27
6	152·40	7	2·1336	12	10·9726	8	12·87
7	177·80	8	2·4384	220	201·2	9	14·48
8	203·20	9 (3 yd.)	2·7432	440	402·3	10	16·09
9	228·60	10	3·0479	880	804·7	11	17·70
10	253·99	11	3·3527	1320	1207·0	12	91·31
11	279·39	12 (4 yd.)	3·6575	1760(m)	1609·3	1NM	1·855

The equivalents of 20, 30, 40, etc., inches, feet, yards or miles appear at once by moving the decimal point one place to the right in the equivalents of 2, 3, 4, etc. The equivalents of the hundreds can be found from the corresponding units by moving the decimal point a second place to the right.

Table for Converting Cwts., Qtrs. and Pounds into Decimals of a Ton.

lb.	Dec. of Ton	lb.	Dec. of Ton	lb.	Dec. of Ton	Cwt.	Dec. of Ton
0¼	·0001	17	·0076	60	·0268	2	·1000
0½	·0002	18	·0080	**70**	**·0312**	3	·1500
1	·0004	19	·0085	80	·0367	4	·2000
2	·0009	20	·0089	**84**	**·0375**	5	·2500
3	·0013	21	·0094	90	·0402	6	·3000
4	·0018	22	·0098	**98**	**·0437**	7	·3500
5	·0022	23	·0102	100	·0446	8	·4000
6	·0027	24	·0107	110	·0491	9	·4500
7	·0031	25	·0111	**112**	**·0500**	10	·5000
8	·0036	26	·0116	150	·0670	11	·5500
9	·0040	27	·0120	200	·0893	12	·6000
10	·0045	**28**	**·0125**	300	·1339	13	·6500
11	·0049	29	·0129	400	·1786	14	·7000
12	·0054	30	·0134	500	·2232	15	·7500
13	·0058	40	·0179	600	·2679	16	·8000
14	**·0062**	**42**	**·0187**	700	·3125	17	·8500
15	·0067	50	·0223	800	·3571	18	·9000
16	·0071	**56**	**·0250**	1000	·4464	19	·9500

Corresponding Temperatures Fahrenheit and Centigrade.

F.	C.	F.	C.	F.	C.	F.	C.
—40	—40	59	15	101·5	38·6	122	50
—31	—35	68	20	102	38·9	(*c*) 212	100
—22	—30	77	25	102·5	39·2	(*f*) 455	235
—13	—25	86	30	103	39·4	(*g*) 509	265
— 4	—20	95	35	103·5	39·7	(*h*) 633	334
0	—17·8	96·8	36	(*c*) 104	40	(*i*) 773	412
+ 5	—15	(*b*) 98·4	36·9	104·5	40·3	(*j*) 809	432
+14	—10	99	37·2	105	40·6	(*k*) 1292	700
+23	— 5	99·5	37·5	106	41·1	(*l*) 1742	950
(*a*) +32	0	100	37·8	107	41·7	(*m*) 2012	1100
41	5	100·5	38·1	108	42·2	(*n*) 2764	1240
50	10	101	38·3	(*d*) 110	43·3	(*o*) 2732	1500

(*a*) Freezing point of pure water. (*b*) Normal temperature of the human body. (*c*) Very high body temperature. (*d*) In most cases a fatal body temperature. (*e*) Boiling point of water under ordinary atmospheric pressure. Melting point of metals: (*f*) tin, (*g*) bismuth, (*h*) lead, (*i*) zinc, (*j*) antimony, (*k*) aluminium, (*l*) silver, (*m*) copper, (*n*) gold, (*o*) wrought iron. The authority followed for the above figures is Phillips and Bauerman's *Elements of Metallurgy*.

To convert any number of degrees Fahrenheit into Centigrade, first deduct 32, then multiply the remainder by 5 and divide by 9.

To convert a number of degrees Centigrade into degrees Fahrenheit, multiply by 9, divide by 5, and add 32.

Table for Converting Miles per Hour into Yards per Minute or Feet per Second.

Miles per Hour	Yards per Minute	Feet per Second	Miles per Hour	Yards per Minute	Feet per Second
1	29⅓	1 7/15	16	469⅓	23 7/15
2	58⅔	2 14/15	17	498⅔	24 14/15
3	88	4⅘	18	528	26⅘
4	117⅓	5 13/15	19	557⅓	27 13/15
5	146⅔	7⅓	20	586⅔	29⅓
6	176	8⅘	25	733⅓	36⅔
7	205⅓	10 7/15	30	880	44
8	234⅔	11 14/15	35	1026⅔	51⅓
9	264	13⅕	40	1173⅓	58⅔
10	293⅓	14⅔	45	1320	66
11	322⅔	16 2/15	50	1466⅔	73⅓
12	362	17⅗	55	1613⅓	80⅔
13	381⅓	19 1/15	60	1760	88
14	410⅔	20 8/15	80	2346⅔	117⅓
15	440	22	100	2933⅓	146⅔

Table Showing the Value per Month, Week, or Day of a stated number of Pounds per Year.

Pr.Yr.	10s.	£1	£2	£3	£4
	d.	s. d.	s. d.	s. d.	s. d.
„Mth.	10	1 8	3 4	5 0	6 8
„Wk.	2¼	0 4½	0 9¼	1 1¾	1 6½
„Day	0¼	0 0½	0 1¼	0 2	0 2¾

Pr.Yr.	£5	£6	£7	£8	£9
	s. d.	s. d.	s. d.	s. d.	s. d.
„Mth.	8 4	10 0	11 8	13 4	15 0
„Wk.	1 11	2 3½	2 8½	3 0¾	3 5½
„Day	0 3½	0 4	0 4¾	0 5½	0 6

Pr.Yr.	£10	£11	£12	£13	£14
	s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	16 8	18 4	1 0 0	1 1 8	1 3 4
„Wk.	3 10	4 2½	0 4 7½	0 4 11⅔	0 5 4½
„Day	0 6½	0 7¼	0 0 8	0 0 8½	0 0 9¼

Pr.Yr.	£15	£16	£17	£18	£19
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	1 5 0	1 6 8	1 8 4	1 10 0	1 11 8
„Wk.	0 5 9	0 6 1⅔	0 6 6½	0 6 10⅓	0 7 3⅓
„Day	0 0 9⅔	0 0 10¼	0 0 11⅓	0 1 0	0 1 0⅔

Pr.Yr.	£20	£21	£22	£23	£24
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	1 13 4	1 15 0	1 16 8	1 18 4	2 0 0
„Wk.	0 7 8	0 8 0⅔	0 8 5⅓	0 8 9¾	0 9 2⅔
„Day	0 1 1⅓	0 1 1⅔	0 1 2⅓	0 1 3	0 1 3⅔

Pr.Yr.	£25	£30	£35	£40	£45
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	2 1 8	2 10 0	2 18 4	3 6 8	3 15 0
„Wk.	0 9 7	0 11 6	0 13 5	0 15 4	0 17 3
„Day	0 1 4½	0 1 7¼	0 1 11	0 2 2½	0 2 5½

Pr.Yr.	£50	£55	£60	£70	£80
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	4 3 4	4 11 8	5 0 0	5 16 8	6 13 4
„Wk.	0 19 2½	1 1 1¼	1 3 0¼	1 6 10⅔	1 10 8⅓
„Day	0 2 9	0 3 0⅓	0 3 3⅓	0 3 10	0 4 4⅔

Pr.Yr.	£90	£100	£150	£200	£250
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
„Mth.	7 10 0	8 6 8	12 10 0	16 13 4	20 16 8
„Wk.	1 14 6½	1 18 4½	2 17 6½	3 16 8⅔	4 15 10½
„Day	0 4 11½	0 5 5½	0 8 2½	0 10 11⅓	0 13 8½

An easy rule for converting money into the decimal of a pound is as follows: Every shilling is ·05, sixpence is ·025, and every farthing of the remainder is ·001, but if the remainder is threepence or over, ·001 must be added. For example, 6s. 4½d. = (6 × ·05) + (19 × ·001) = ·3 + ·019 + ·001 = ·320 of a pound

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

DISCOUNT (AND PROFIT ON COST) TABLES

The following Tables show the percentage on any sum from one farthing to hundreds of pounds. Up to, and including, 3½%, the results are given to the nearest farthing (half a farthing counts as a farthing); up to 17½%, to the nearest halfpenny; and up to 33⅓%, to the nearest penny.

To find the discount or the profit on any amount below a pound, if the amount is not stated in the table, find the two consecutive amounts between which it falls and take the result given for the smaller.

Example: What is the discount at 11½% on £47 17 3½. The discount on £40 is 10/-, on £7 is 1/9, total discount for the pounds is 11/9; 17/3½ falls between 17/6 and 15/10, and the discount on the smaller of these is 2½d.; the total discount at 11½% on £47 17 3½ is therefore 11/9+2½d.=11/11½.

1½% Discount (or Profit) at 1½. 1½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt	Dis.
s. d.	s. d.	£ s. d.	s. d.	£	s. d.	£	£ s. d.
0 0½	0 0	0 19 2	0 3	11	2 9	50	0 12 6
0 10	0 0½	—	—	12	3 0	60	0 15 0
2 6	0 0½	1 0 0	0 3	13	3 3	70	0 17 6
4 2	0 0½	2 0 4	0 6	14	3 6	80	1 0 0
5 10	0 1	3 0 0	0 9	15	3 9	90	1 2 6
7 6	0 1½	4 0 0	0 1 0	16	4 0	100	1 5 0
9 2	0 1½	5 0 0	0 1 3	17	4 3	200	2 10 0
10 10	0 1½	6 0 0	0 1 6	18	4 6	250	3 2 6
12 6	0 2	7 0 0	0 1 9	19	4 9	300	3 15 0
14 2	0 2½	8 0 0	0 2 0	20	5 0	400	5 0 0
15 10	0 2½	9 0 0	0 2 3	30	7 6	500	6 5 0
17 6	0 2½	10 0 0	0 2 6	40	10 0	800	10 0 0

2½% Discount (or Profit) at 2½. 2½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt	Dis.
s. d.	s. d.	£ s. d.	s. d.	£	s. d.	£	£ s. d.
0 0½	0 0	0 12 1	0 3½	5	2 6	20	0 10 0
0 5	0 0½	0 12 11	0 4	6	3 0	30	0 15 0
1 3	0 0½	0 13 9	0 4½	7	3 6	40	1 0 0
2 1	0 0½	0 14 7	0 4½	8	4 0	50	1 5 0
2 11	0 1	0 15 5	0 5	9	4 6	60	1 10 0
3 9	0 1½	0 16 3	0 5	10	5 0	70	1 15 0
4 7	0 1½	0 17 1	0 5½	11	5 6	80	2 0 0
5 5	0 1½	0 17 11	0 5½	12	6 0	90	2 5 0
6 3	0 2	0 18 9	0 5½	13	6 6	100	2 10 0
7 1	0 2½	0 19 7	0 6	14	7 0	200	5 0 0
7 11	0 2½	—	—	15	7 6	250	6 5 0
8 9	0 2½	1 0 0	0 6	16	8 0	300	7 10 0
9 7	0 3	2 0 0	0 1 0	17	8 6	400	10 0 0
10 5	0 3½	3 0 0	0 1 6	18	9 0	500	12 10 0
11 3	0 3½	4 0 0	0 2 0	19	9 6	800	20 0 0

3% Discount (or Profit) at 3. 3%

Amt.	Dis.	Amt.	Dis.	Amt	Dis.	Amt	Dis.
s. d.	d.	£ s. d.	s. d.	£	s. d.	£	£ s. d.
0 0½	0	0 12 2	0 4½	6	3 7½	60	1 16 0
0 4½	0 1	0 12 10½	0 4½	7	4 2½	70	2 2 0
1 0½	0 1½	0 13 6½	0 5	8	4 9½	75	2 5 0
1 9	0 1½	0 14 3	0 5½	9	5 4½	80	2 8 0
2 5½	1	0 14 11½	0 5½	10	6 0	90	2 14 0
3 1½	1½	0 15 7½	0 5½	11	6 7½	100	3 0 0
3 10	1½	0 16 4	0 6	12	7 2½	150	4 10 0
4 6½	1½	0 17 0½	0 6½	13	7 9½	200	6 0 0
5 2½	2	0 17 8½	0 6½	14	8 4½	250	7 10 0
5 11	2½	0 18 5	0 6½	15	9 0	300	9 0 0
6 7½	2½	0 19 1½	0 7	16	9 7½	400	12 0 0
7 3½	2½	0 19 9½	0 7½	17	10 2½	500	15 0 0
8 0	3	—	—	18	10 9½	600	18 0 0
8 8½	3½	1 0 0	0 7½	19	11 4½	700	21 0 0
9 4½	3½	2 0 0	0 1 2½	20	12 0	800	24 0 0
10 1	3½	3 0 0	0 1 9½	30	18 0	750	22 10 0
10 9½	4	4 0 0	0 2 4½	40	24 0	900	27 0 0
11 5½	4½	5 0 0	0 3 0	50	30 0	1000	30 0 0

3½% Discount (or Profit) at 3½. 3½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt	Dis.
s. d.	d.	s. d.	d.	£ s. d.	s. d.	£	£ s. d.
0 0½	0	11 4½	5½	5 0 0	3 9	26	0 19 6
0 3½	0½	11 11½	5½	6 0 0	4 6	27	1 0 3
0 10	0½	12 6	5½	7 0 0	5 3	28	1 1 0
1 4½	0½	13 0½	6	8 0 0	6 0	29	1 1 9
1 11½	1	13 7½	6½	9 0 0	6 9	30	1 2 6
2 6	1½	14 2	6½	10 0 0	7 6	35	1 16 3
3 0½	1½	14 8½	6½	11 0 0	8 3	40	1 10 0
3 7½	1½	15 3½	7	12 0 0	9 0	45	1 13 9
4 2	2	15 10	7½	13 0 0	9 9	50	1 17 6
4 8½	2½	16 4½	7½	14 0 0	10 6	55	2 1 3
5 3½	2½	16 11½	7½	15 0 0	11 3	60	2 5 0
5 10	2½	17 6	8	16 0 0	12 0	70	2 12 6
6 4½	3	18 0½	8½	17 0 0	12 9	80	3 0 0
6 11½	3½	18 7½	8½	18 0 0	13 6	90	3 7 6
7 6	3½	19 2	8½	19 0 0	14 3	100	3 15 0
8 0½	3½	19 8½	9	20 0 0	15 0	200	7 10 0
8 7½	4	—	—	21 0 0	15 9	300	11 5 0
9 2	4½	20 0 9	22	0 0	16 6	400	15 0 0
9 8½	4½	40 0 18	23	0 0	17 3	500	18 15 0
10 3½	4½	60 0 27	24	0 0	18 0	600	22 0 0
10 10	5	80 0 36	25	0 0	18 9	800	30 0 0

4% Discount (or Profit) at 4. 4%

Amt.	Dis	Amt.	Dis	Amt.	Dis.	Amt	Dis.
s. d.	d.	s. d.	d.	£ s. d.	s. d.	£	£ s. d.
0 0½	0	13 4½	6½	13 0 0	10 4½	39	1 11 2½
0 3½	0½	13 10½	6½	14 0 0	11 2½	40	1 12 0
0 9½	0½	14 5	7	15 0 0	12 0	45	1 16 0
1 3½	0½	14 11½	7½	16 0 0	12 9½	50	2 0 0
1 10	1	15 5½	7½	17 0 0	13 7½	55	2 4 0
2 4½	1½	15 11½	7½	18 0 0	14 4½	60	2 8 0
2 10½	1½	16 6	8	19 0 0	15 2½	65	2 12 0
3 4½	1½	17 0½	8½	20 0 0	16 0	70	2 16 0
4 0	2	17 6½	8½	21 0 0	16 9½	75	3 0 0
4 6½	2½	18 0½	8½	22 0 0	17 7½	80	3 4 0
5 0½	2½	18 7	9	23 0 0	18 4½	85	3 8 0
5 6½	2½	19 1½	9½	24 0 0	19 2½	90	3 12 0
6 1	3	19 7½	9½	25 0 0	20 0	95	3 16 0
6 7½	3½	—	—	26 0 0	20 9½	100	4 0 0
7 1½	3½	20 0	9½	27 0 0	21 7½	125	5 0 0
7 7½	3½	40 0	19½	28 0 0	22 4½	150	6 0 0
8 2	4	60 0	28½	29 0 0	23 2½	175	7 0 0
8 8½	4½	80 0	38½	30 0 0	24 0	200	8 0 0
9 2½	4½	100 0	48	31 0 0	24 9½	250	10 0 0
9 8½	4½	120 0	57½	32 0 0	25 7½	300	12 0 0
10 3	5	140 0	67½	33 0 0	26 4½	400	16 0 0
10 9½	5½	160 0	76½	34 0 0	27 2½	500	20 0 0
11 3½	5½	180 0	86½	35 0 0	28 0	600	24 0 0
11 9½	5½	200 0	96	36 0 0	28 9½	700	28 0 0
12 4	6	220 0	105½	37 0 0	29 7½	800	32 0 0
12 10½	6½	240 0	115½	38 0 0	30 4½	900	36 0 0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

4½% Discount (or Profit) at 4½. 4½%

Amt.	Dis	Amt.	Dis	Amt.	Dis.	Amt	Dis.
s. d.	d.	s. d.	d.	£ s. d.	s. d.	£	£ s. d.
0 0½	0	8 1½	4½	0 16 5½	0 9	11	0 9 10½
0 2½	0½	8 6½	4½	0 16 11½	0 9½	12	0 10 9
0 8½	0½	9 0½	5	0 17 4½	0 9½	13	0 11 8½
1 1½	0½	9 6	5½	0 17 10½	0 9½	14	0 12 7½
1 7½	1	9 11½	5½	0 18 4	0 10	15	0 13 6
2 1	1½	10 5½	5½	0 18 9½	0 10½	16	0 14 4½
2 6½	1½	10 10½	6	0 19 3	0 10½	17	0 15 3½
3 0½	1½	11 4½	6½	0 19 8½	0 10½	18	0 16 2½
3 5½	2	11 10	6½	—	—	19	0 17 1½
3 11½	2½	12 3½	6½	1 0 0	0 10½	20	0 18 0
4 4½	2½	12 9	7	2 0 0	1 9½	30	1 7 0
4 10½	2½	13 2½	7½	3 0 0	2 8½	40	1 16 0
5 4	3	13 8½	7½	4 0 0	3 7½	50	2 5 0
5 9½	3½	14 1½	7½	5 0 0	4 6	60	2 14 0
6 3	3½	14 7½	8	7 0 0	6 3½	70	3 3 0
6 8½	3½	15 1	8½	8 0 0	7 2½	80	3 12 0
7 2½	4	15 6½	8½	9 0 0	8 1½	90	4 1 0
7 7½	4½	16 0	8½	10 0 0	9 0	100	4 10 0

5% Discount (or Profit) at 5. 5%

Amt.	Dis	Amt.	Dis	Amt.	Dis.	Amt	Dis.
s. d.	d.	s. d.	d.	£ s. d.	s. d.	£	£ s. d.
0 0½	0	8 1½	5	0 16 5½	0 10	11	0 11 0
0 2½	0½	8 6½	5½	0 16 10½	0 10½	12	0 12 0
0 7½	0½	8 11½	5½	0 17 3½	0 10½	13	0 13 0
1 0½	0½	9 4½	5½	0 17 8½	0 10½	14	0 14 0
1 5½	1	9 9½	6	0 18 1½	0 11	15	0 15 0
1 10½	1½	10 2½	6½	0 18 6½	0 11½	16	0 16 0
2 3½	1½	10 7½	6½	0 18 11½	0 11½	17	0 17 0
2 8½	1½	11 0½	6½	0 19 4½	0 11½	18	0 18 0
3 1½	2	11 5½	7	0 19 9½	1 0	19	0 19 0
3 6½	2½	11 10½	7½	—	—	20	1 0 0
3 11½	2½	12 3½	7½	1 0 0	1 0	30	1 10 0
4 4½	2½	12 8½	7½	2 0 0	2 0	40	2 0 0
4 9½	3	13 1½	8	3 0 0	3 0	50	2 10 0
5 2½	3½	13 6½	8½	4 0 0	4 0	60	3 0 0
5 7½	3½	13 11½	8½	5 0 0	5 0	70	3 10 0
6 0½	3½	14 4½	8½	6 0 0	6 0	80	4 0 0
6 5½	4	14 9½	9	7 0 0	7 0	90	4 10 0
6 10½	4½	15 2½	9½	8 0 0	8 0	100	5 0 0
7 3½	4½	15 7½	9½	9 0 0	9 0	300	15 0 0
7 8½	4½	16 0½	9½	10 0 0	10 0	500	25 0 0

6½% Discount (or Profit) at 6½. 6½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	d.	£ s. d.	s. d.	£ s. d.	s. d.
0 0½	0	0 9 2	0 0 7	18 6	0 1 2
0 2	0½	0 9 6	0 0 7½	18 10	0 1 2½
0 6	0½	0 9 10	0 0 7½	19 2	0 1 2½
0 10	0½	0 10 2	0 0 7½	19 6	0 1 2½
1 2	1	0 10 6	0 0 8	19 10	0 1 3
1 6	1½	0 10 10	0 0 8½	£	
1 10	1½	0 11 2	0 0 8½	1	0 1 3
2 2	1½	0 11 6	0 0 8½	2	0 2 6
2 6	2	0 11 10	0 0 9	3	0 3 9
2 10	2½	0 12 2	0 0 9½	4	0 5 0
3 2	2½	0 12 6	0 0 9½	5	0 6 3
3 6	2½	0 12 10	0 0 9½	6	0 7 6
3 10	3	0 13 2	0 0 10	7	0 8 9
4 2	3½	0 13 6	0 0 10½	8	0 10 0
4 6	3½	0 13 10	0 0 10½	9	0 11 3
4 10	3½	0 14 2	0 0 10½	10	0 12 6
5 2	4	0 14 6	0 0 11	20	1 5 0
5 6	4½	0 14 10	0 0 11½	30	1 17 6
5 10	4½	0 15 2	0 0 11½	40	2 10 0
6 2	4½	0 15 6	0 0 11½	50	3 2 6
6 6	5	0 15 10	0 1 0	60	3 15 0
6 10	5½	0 16 2	0 1 0½	70	4 7 6
7 2	5½	0 16 6	0 1 0½	80	5 0 0
7 6	5½	0 16 10	0 1 0½	90	5 12 6
7 10	6	0 17 2	0 1 1	100	6 5 0
8 2	6½	0 17 6	0 1 1½	200	12 10 0
8 6	6½	0 17 10	0 1 1½	250	15 12 6
8 10	6½	0 18 2	0 1 1½	500	31 5 0

7% Discount (or Profit) at 7½. 7½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	d.	£ s. d.	s. d.	s. d.	£ s. d.
0 0½	0	0 9 3½	0 8½	18 9	0 1 5
0 1½	0½	0 9 7	0 8½	19 0½	0 1 5½
0 5	0½	0 9 10½	0 9	19 3½	0 1 5½
0 8½	0½	0 10 1½	0 9½	19 7	0 1 5½
0 11½	1	0 10 5	0 9½	19 10½	0 1 6
1 3	1½	0 10 8½	0 9½	£	
1 6½	1½	0 10 11½	0 10	1	0 1 6
1 9½	1½	0 11 3	0 10½	2	0 3 0
2 1	2	0 11 6½	0 10½	3	0 4 6
2 4½	2½	0 11 9½	0 10½	4	0 6 0
2 7½	2½	0 12 1	0 11	5	0 7 6
2 11	2½	0 12 4½	0 11½	6	0 9 0
3 2½	3	0 12 7½	0 11½	7	0 10 6
3 5½	3½	0 12 11	0 11½	8	0 12 0
3 9	3½	0 13 2½	1 0	9	0 13 6
4 0½	3½	0 13 5½	1 0½	10	0 15 0
4 3½	4	0 13 9	1 0½	11	0 16 6
4 7	4½	0 14 0½	1 0½	12	0 18 0
4 10½	4½	0 14 3½	1 1	13	0 19 6
5 1½	4½	0 14 7	1 1½	14	1 1 0
5 5	5	0 14 10½	1 1½	15	1 2 6
5 8½	5½	0 15 1½	1 1½	16	1 4 0
5 11½	5½	0 15 5	1 2	17	1 5 6
6 3	5½	0 15 8½	1 2½	18	1 7 0
6 6½	6	0 15 11½	1 2½	19	1 8 6
6 9½	6½	0 16 3	1 2½	20	1 10 0
7 1	6½	0 16 6½	1 3	30	2 5 0
7 4½	6½	0 16 9½	1 3½	40	3 0 0
7 7½	7	0 17 1	1 3½	50	3 15 0
7 11	7½	0 17 4½	1 3½	60	4 10 0
8 2½	7½	0 17 7½	1 4	70	5 5 0
8 5½	7½	0 17 11	1 4½	80	6 0 0
8 9	8	0 18 2½	1 4½	90	6 15 0
9 0½	8½	0 18 5½	1 4½	100	7 10 0

8½% Discount (or Profit) at 8½. 8½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	d.	s. d.	d.	£ s. d.	s. d.
0 0½	0	9 2	0 9½	0 18 5½	0 1 7½
0 1½	0½	9 5	0 10	0 18 8½	0 1 7½
0 4½	0½	9 7½	0 10½	0 18 11½	0 1 8
0 7½	0½	9 10½	0 10½	0 19 2	0 1 8½
0 10	1	10 1½	0 10½	0 19 5	0 1 8½
1 0½	1½	10 4½	0 11	0 19 7½	0 1 8½
1 3½	1½	10 7½	0 11½	0 19 10½	0 1 9
1 6½	1½	10 10	0 11½	—	—
1 9½	2	11 1	0 11½	1 0 0	0 1 9
2 0½	2½	11 3½	1 0	2 0 0	0 3 6
2 3½	2½	11 6½	1 0½	3 0 0	0 5 3
2 6	2½	11 9½	1 0½	4 0 0	0 7 0
2 9	3	12 0½	1 0½	5 0 0	0 8 9
2 11½	3½	12 3½	1 1	6 0 0	0 10 6
3 2½	3½	12 6	1 1½	7 0 0	0 12 3
3 5½	3½	12 9	1 1½	8 0 0	0 14 0
3 8½	4	12 11½	1 1½	9 0 0	0 15 9
3 11½	4½	13 2½	1 2	10 0 0	0 17 6
4 2	4½	13 5½	1 2½	11 0 0	0 19 3
4 5	4½	13 8½	1 2½	12 0 0	1 1 0
4 7½	5	13 11½	1 2½	13 0 0	1 2 9
4 10½	5½	14 2	1 3	14 0 0	1 4 6
5 1½	5½	14 5	1 3½	15 0 0	1 6 3
5 4½	5½	14 7½	1 3½	16 0 0	1 8 0
5 7½	6	14 10½	1 3½	17 0 0	1 9 9
5 10	6½	15 1½	1 4	18 0 0	1 11 6
6 1	6½	15 4½	1 4½	19 0 0	1 13 3
6 3½	6½	15 7½	1 4½	20 0 0	1 15 0
6 6½	7	15 10	1 4½	30 0 0	2 12 6
6 9½	7½	16 1	1 5	40 0 0	3 10 0
7 0½	7½	16 3½	1 5½	50 0 0	4 7 6
7 3½	7½	16 6½	1 5½	60 0 0	5 5 0
7 6	8	16 9½	1 5½	70 0 0	6 2 6
7 9	8½	17 0½	1 6	80 0 0	7 0 0
7 11½	8½	17 3½	1 6½	90 0 0	7 17 6
8 2½	8½	17 6	1 6½	100 0 0	8 15 0
8 5½	9	17 9	1 6½	200 0 0	17 10 0
8 8½	9½	17 11½	1 7	250 0 0	21 17 6
8 11½	9½	18 2½	1 7½	500 0 0	43 15 0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

10% Discount (or Profit) at 10. 10%

Amt.	D.	Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	s. d.
0 0½	0	6 0½	0 7½	12 3½	1 3	0 18 6½	1 10½
0 2½	0½	6 5½	0 8	12 8½	1 3½	0 18 11½	1 11
0 7½	1	6 10½	0 8½	13 1½	1 4	0 19 4½	1 11½
1 0½	1½	7 3½	0 9	13 6½	1 4½	0 19 9½	2 0
1 5½	2	7 8½	0 9½	13 11½	1 5	—	—
1 10½	2½	8 1½	0 10	14 4½	1 5½	1 0 0	2 0
2 3½	3	8 6½	0 10½	14 9½	1 6	2 0 0	4 0
2 8½	3½	8 11½	0 11	15 2½	1 6½	3 0 0	6 0
3 1½	4	9 4½	0 11½	15 7½	1 7	4 0 0	8 0
3 6½	4½	9 9½	1 0	16 0½	1 7½	5 0 0	10 0
3 11½	5	10 2½	1 0½	16 5½	1 8	6 0 0	12 0
4 4½	5½	10 7½	1 1	16 10½	1 8½	7 0 0	14 0
4 9½	6	11 0½	1 1½	17 3½	1 9	8 0 0	16 0
5 2½	6½	11 5½	1 2	17 8½	1 9½	9 0 0	18 0
6 7½	7	11 10½	1 2½	18 1½	1 10	10 0 0	20 0

For every **£10** amt. the dis. is **£1.**

N.B.—This Table and the next three give the discount to the nearest halfpenny; a farthing or any sum between a farthing and a halfpenny is counted as a halfpenny.

12½% Discount (or Profit) at 12½. 12½%

Amt.	Dis	Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	£ s. d.
0 0½	0	5 6 0	8½	11 2 1	5	0 18 10 0	2 1½
0 2	0½	5 10 0	9	11 6 1	5½	0 17 2 0	2 2
0 6	1	6 2 0	9½	11 10 1	6	0 17 6 0	2 2½
0 10	1½	6 6 0	10	12 2 1	6½	0 17 10 0	2 3
1 2	2	6 10 0	10½	12 6 1	7	0 18 2 0	2 3½
1 6	2½	7 2 0	11	12 10 1	7½	0 18 6 0	2 4
1 10	3	7 6 0	11½	13 2 1	8	0 18 10 0	2 4½
2 2	3½	7 10 1	0	13 6 1	8½	0 19 2 0	2 5
2 6	4	8 2 1	0½	13 10 1	9	0 19 6 0	2 5½
2 10	4½	8 6 1	1	14 2 1	9½	0 19 10 0	2 6
3 2	5	8 10 1	1½	14 6 1	10	—	—
3 6	5½	9 2 1	2	14 10 1	10½	1 0 0 0	2 6
3 10	6	9 6 1	2½	15 2 1	11	3 0 0 0	7 6
4 2	6½	9 10 1	3	15 6 1	11½	5 0 0 0	12 6
4 6	7	10 2 1	3½	15 10 2	0	7 0 0 0	17 6
4 10	7½	10 6 1	4	16 2 2	0½	9 0 0 0	2 6
5 2	8	10 10 1	4½	16 6 2	1	10 0 0 0	5 0

15% Discount (or Profit) at 15. 15%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	s. d.	£ s. d.	s. d.	s. d.	£ s. d.
0 0½	0 0	0 7 11	1 2½	15 11½	0 2 5
0 1½	0 0½	0 8 2½	1 3	16 3 0	0 2 5½
0 5	0 1	0 8 5½	1 3½	16 6½	0 2 6
0 8½	0 1½	0 8 9	1 4	16 9½	0 2 6½
0 11½	0 2	0 9 0½	1 4½	17 1	0 2 7
1 3	0 2½	0 9 3½	1 5	17 4½	0 2 7½
1 6½	0 3	0 9 7	1 5½	17 7½	0 2 8
1 9½	0 3½	0 9 10½	1 6	17 11	0 2 8½
2 1	0 4	0 10 1½	1 6½	18 2½	0 2 9
2 4½	0 4½	0 10 5	1 7	18 5½	0 2 9½
2 7½	0 5	0 10 8½	1 7½	18 9	0 2 10
2 11	0 5½	0 10 11½	1 8	19 0½	0 2 10½
2 3	0 6	0 11 3	1 8½	19 3½	0 2 11
3 5½	0 6½	0 11 6½	1 9	19 7	0 2 11½
3 9	0 7	0 11 9½	1 9½	19 10½	0 3 0
4 0½	0 7½	0 12 1	1 10	£	
4 3½	0 8	0 12 4½	1 10½	1	0 3 0
4 7	0 8½	0 12 7½	1 11	2	0 6 0
4 10½	0 9	0 12 11	1 11½	3	0 9 0
5 1½	0 9½	0 13 2½	2 0	4	0 12 0
5 5	0 10	0 13 5½	2 0½	5	0 15 0
5 8½	0 10½	0 13 9	2 1	6	0 18 0
5 11½	0 11	0 14 0½	2 1½	7	1 1 0
6 3	0 11½	0 14 3½	2 2	8	1 4 0
6 6½	0 12	0 14 7	2 2½	9	1 7 0
6 9½	1 0	0 14 10½	2 3	10	1 10 0
7 1	1 0½	0 15 1½	2 3½	20	3 0 0
7 4½	1 1	0 15 5	2 4	50	7 10 0
7 7½	1 1½	0 15 8½	2 4½	100	15 0 0

In the previous Table and the one which follows, *Discount* is shown calculated to the nearest halfpenny. For smaller sums in many cases the *Amount* shows farthings for the sake of greater accuracy.

17½% Discount (or Profit) at 17½. 17½%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	s. d.	s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
0 0½	0 0	9 7½	1 8½	0 19 5	0 3 5	10 2½	1 9
0 1½	0 0½	9 10½	1 9	0 19 7½	0 3 5½	10 5½	1 9½
0 4½	0 1	10 1½	1 9½	0 19 10½	0 3 6	10 8½	1 10
0 7½	0 1½	10 4½	1 10	—	—	10 11½	1 10½
0 10	0 2	10 7½	1 10½	1 0 0	0 3 6	11 2½	1 11
1 0½	0 2½	10 10	1 11	2 0 0	0 7 0	11 5½	1 11½
1 3½	0 3	11 1	1 11½	3 0 0	0 10 6	11 8½	1 12
1 6½	0 3½	11 3½	2 0	4 0 0	0 14 0	11 11½	1 12½
1 9½	0 4	11 6½	2 0½	5 0 0	0 17 6	12 2½	1 13
2 0½	0 4½	11 9½	2 1	6 0 0	1 1 0	12 5½	1 13½
2 3½	0 5	12 0½	2 1½	7 0 0	1 4 6	12 8½	1 14
2 6	0 5½	12 3½	2 2	8 0 0	1 8 0	12 11½	1 14½
2 9	0 6	12 6	2 2½	9 0 0	1 11 6	13 2½	1 15
2 11½	0 6½	12 9	2 3	10 0 0	1 15 0	13 5½	1 15½
3 2½	0 7	12 11½	2 3½	11 0 0	1 18 6	13 8½	1 16
3 5½	0 7½	13 2½	2 4	12 0 0	2 2 0	13 11½	1 16½
3 8½	0 8	13 5½	2 4½	13 0 0	2 5 6	14 2½	1 17
3 11½	0 8½	13 8½	2 5	14 0 0	2 9 0	14 5½	1 17½
4 2	0 9	13 11½	2 5½	15 0 0	2 12 6	14 8½	1 18
4 5	0 9½	14 2	2 6	16 0 0	2 16 0	14 11½	1 18½
4 7½	0 10	14 5	2 6½	17 0 0	2 19 6	15 2½	1 19
4 10½	0 10½	14 7½	2 7	18 0 0	3 3 0	15 5½	1 19½
5 1½	0 11	14 10½	2 7½	19 0 0	3 6 6	15 8½	2 0
5 4½	0 11½	15 1½	2 8	20 0 0	3 10 0	15 11½	2 0½
5 7½	1 0	15 4½	2 8½	30 0 0	5 5 0	16 2½	2 1
5 10	1 0½	15 7½	2 9	40 0 0	7 0 0	16 5½	2 1½
6 1	1 1	15 10	2 9½	50 0 0	8 15 0	16 8½	2 2
6 3½	1 1½	16 1	2 10	60 0 0	10 10 0	16 11½	2 2½
6 6½	1 2	16 3½	2 10½	70 0 0	12 5 0	17 2½	2 3
6 9½	1 2½	16 6½	2 11	80 0 0	14 0 0	17 5½	2 3½
7 0½	1 3	16 9½	2 11½	90 0 0	15 15 0	17 8½	2 4
7 3½	1 3½	17 0½	3 0	100 0 0	17 10 0	17 11½	2 4½
7 6	1 4	17 3½	3 0½	200 0 0	35 0 0	18 2½	2 5
7 9	1 4½	17 6	3 1	250 0 0	43 15 0	18 5½	2 5½
7 11½	1 5	17 9	3 1½	300 0 0	52 10 0	18 8½	2 6
8 2½	1 5½	17 11½	3 2	400 0 0	70 0 0	18 11½	2 6½
8 5½	1 6	18 2½	3 2½	500 0 0	87 10 0	19 2½	2 7
8 8½	1 6½	18 5½	3 3	600 0 0	105 0 0	19 5½	2 7½
8 11½	1 7	18 8½	3 3½	700 0 0	122 10 0	19 8½	2 8
9 2	1 7½	18 11½	3 4	800 0 0	140 0 0	19 11½	2 8½
9 5	1 8	19 2	3 4½	900 0 0	157 10 0	20 2½	2 9

20% Discount (or Profit) at 20. 20%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis	Amt	Dis.
s. d.	s. d.	s. d.	s. d.	£ s. d.	s.	£	£ s. d.
0 1	0 0	10 2½	2 1	3 0 0	12	28	5 12 0
0 2½	0 1	10 7½	2 2	4 0 0	16	29	5 16 0
0 7½	0 2	11 0½	2 3	5 0 0	20	30	6 0 0
1 0½	0 3	11 5½	2 4	6 0 0	24	31	6 4 0
1 5½	0 4	11 10½	2 5	7 0 0	28	32	6 8 0
1 10½	0 5	12 3½	2 6	8 0 0	32	33	6 12 0
2 3½	0 6	12 8½	2 7	9 0 0	36	34	6 16 0
2 8½	0 7	13 1½	2 8	10 0 0	40	35	7 0 0
3 1½	0 8	13 6½	2 9	11 0 0	44	36	7 4 0
3 6½	0 9	13 11½	2 10	12 0 0	48	37	7 8 0
3 11½	0 10	14 4½	2 11	13 0 0	52	38	7 12 0
4 4½	0 11	14 9½	3 0	14 0 0	56	39	7 16 0
4 9½	1 0	15 2½	3 1	15 0 0	60	40	8 0 0
5 2½	1 1	15 7½	3 2	16 0 0	64	45	9 0 0
5 7½	1 2	16 0½	3 3	17 0 0	68	50	10 0 0
6 0½	1 3	16 5½	3 4	18 0 0	72	75	15 0 0
6 5½	1 4	16 10½	3 5	19 0 0	76	100	20 0 0
6 10½	1 5	17 3½	3 6	20 0 0	80	200	40 0 0
7 3½	1 6	17 8½	3 7	21 0 0	84	250	50 0 0
7 8½	1 7	18 1½	3 8	22 0 0	88	300	60 0 0
8 1½	1 8	18 6½	3 9	23 0 0	92	400	80 0 0
8 6½	1 9	18 11½	3 10	24 0 0	96	500	100 0 0
8 11½	1 10	19 4½	3 11	25 0 0	100	600	120 0 0
9 4½	1 11	19 9½	4 0	26 0 0	104	750	150 0 0
9 9½	2 0	20 0 0	4 0	27 0 0	108	1000	200 0 0

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This Table and the next two give the discount to the nearest penny; a halfpenny, or any sum between a halfpenny and a penny, is counted as a penny.

25% Discount (or Profit) at 25. 25%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	£ s.
0 0½	0 0	8 10½	2 3	17 10	4 6	25 0 0	6 5
0 2	0 1	9 2	2 4	18 2	4 7	26 0 0	6 10
0 6	0 2	9 6½	2 5	18 6	4 8	27 0 0	6 15
0 10	0 3	9 10½	2 6	18 10	4 9	28 0 0	7 0
1 2	0 4	10 2	2 7	19 2	4 10	29 0 0	7 5
1 6	0 5	10 6	2 8	19 6	4 11	30 0 0	7 10
1 10	0 6	10 10½	2 9	£	s.	31 0 0	7 15
2 2	0 7	11 2	2 10	1	5	32 0 0	8 0
2 6	0 8	11 6½	2 11	2	10	33 0 0	8 5
2 10	0 9	11 10½	3 0	3	15	34 0 0	8 10
3 2	0 10	12 2½	3 1	4	20	35 0 0	8 15
3 6	0 11	12 6½	3 2	5	25	36 0 0	9 0
3 10	1 0	12 10½	3 3	6	30	37 0 0	9 5
4 2	1 1	13 2½	3 4	7	35	38 0 0	9 10
4 6	1 2	13 6½	3 5	8	40	39 0 0	9 15
4 10	1 3	13 10½	3 6	9	45	40 0 0	10 0
5 2	1 4	14 2½	3 7	10	50	45 0 0	11 5
5 6	1 5	14 6½	3 8	11	55	50 0 0	12 10
5 10	1 6	14 10½	3 9	13	65	100 0 0	25 0
6 2	1 7	15 2½	3 10	15	75	200 0 0	50 0
6 6	1 8	15 6½	3 11	17	85	300 0 0	75 0
6 10	1 9	15 10½	4 0	19	95	400 0 0	100 0
7 2	1 10	16 2½	4 1	20	100	500 0 0	125 0
7 6	1 11	16 6½	4 2	21	105	600 0 0	150 0
7 10	2 0	16 10½	4 3	22	110	700 0 0	175 0
8 2	2 1	17 2½	4 4	23	115	800 0 0	200 0
8 6	2 2	17 6½	4 5	24	120	1000 0 0	250 0

Discount to the nearest penny.

30% Discount (or Profit) at 30. 30%

Amt.	Dis.	Amt	Dis.	Amt.	Dis.
s. d.	s. d.	£ s. d.	s. d.	£	£ s. d.
0 0½	0 0	0 10 5	3 2	3	0 18 0
0 1½	0 1	0 10 8½	3 3	4	1 4 0
0 5	0 2	0 10 11½	3 4	5	1 10 0
0 8½	0 3	0 11 3	3 5	6	1 16 0
0 11½	0 4	0 11 6½	3 6	7	2 2 0
1 3	0 5	0 11 9½	3 7	8	2 8 0
1 6½	0 6	0 12 1	3 8	9	2 14 0
1 9½	0 7	0 12 4½	3 9	10	3 0 0
2 1	0 8	0 12 7½	3 10	11	3 6 0
2 4½	0 9	0 12 11	3 11	12	3 12 0
2 7½	0 10	0 13 2½	4 0	13	3 18 0
2 11	0 11	0 13 5½	4 1	14	4 4 0
3 2½	1 0	0 13 9	4 2	15	4 10 0
3 5½	1 1	0 14 0½	4 3	16	4 16 0
3 9	1 2	0 14 3½	4 4	17	5 2 0
4 0½	1 3	0 14 7	4 5	18	5 8 0
4 3½	1 4	0 14 10½	4 6	19	5 14 0
4 7	1 5	0 15 1½	4 7	20	6 0 0
4 10½	1 6	0 15 5	4 8	25	7 10 0
5 1½	1 7	0 15 8½	4 9	30	9 0 0
5 5	1 8	0 15 11½	4 10	40	12 0 0
5 8½	1 9	0 16 3	4 11	50	15 0 0
5 11½	1 10	0 16 6½	5 0	60	18 0 0
6 3	1 11	0 16 9½	5 1	70	21 0 0
6 6½	2 0	0 17 1	5 2	75	22 10 0
6 9½	2 1	0 17 4½	5 3	80	24 0 0
7 1	2 2	0 17 7½	5 4	90	27 0 0
7 4½	2 3	0 17 11	5 5	100	30 0 0
7 7½	2 4	0 18 2½	5 6	150	45 0 0
7 11	2 5	0 18 5½	5 7	200	60 0 0
8 2½	2 6	0 18 9	5 8	300	90 0 0
8 5½	2 7	0 19 0½	5 9	400	120 0 0
8 9	2 8	0 19 3½	5 10	500	150 0 0
9 0½	2 9	0 19 7	5 11	600	180 0 0
9 3½	2 10	0 19 10½	6 0	700	210 0 0
9 7	2 11	—	—	800	240 0 0
9 10½	3 0	1 0 0	6 0	900	270 0 0
10 1½	3 1	2 0 0	12 0	1000	300 0 0

Discount to the nearest penny.

33⅓% Discount (or Profit) at 33⅓. 33⅓%

Amt.	Dis.	Amt.	Dis.	Amt.	Dis.
s. d.	s. d.	s. d.	s. d.	£ s. d.	£ s. d.
0 0½	0 0	9 4½	3 2	0 18 10½	0 6 4
0 1½	0 1	9 7½	3 3	0 19 1½	0 6 5
0 4½	0 2	9 10½	3 4	0 19 4½	0 6 6
0 7½	0 3	10 1½	3 5	0 19 7½	0 6 7
0 10½	0 4	10 4½	3 6	0 19 10½	0 6 8
1 1½	0 5	10 7½	3 7	—	—
1 4½	0 6	10 10½	3 8	1 0 0	0 6 8
1 7½	0 7	11 1½	3 9	2 0 0	0 13 4
2 10½	0 8	11 4½	3 10	3 0 0	1 0 0
2 1½	0 9	11 7½	3 11	4 0 0	1 6 8
2 4½	0 10	11 10½	4 0	5 0 0	1 13 4
2 7½	0 11	12 1½	4 1	6 0 0	2 0 0
2 10½	1 0	12 4½	4 2	7 0 0	2 6 8
3 1½	1 1	12 7½	4 3	8 0 0	2 13 4
3 4½	1 2	12 10½	4 4	9 0 0	3 0 0
3 7½	1 3	13 1½	4 5	10 0 0	3 6 8
3 10½	1 4	13 4½	4 6	11 0 0	3 13 4
4 1½	1 5	13 7½	4 7	12 0 0	4 0 0
4 4½	1 6	13 10½	4 8	13 0 0	4 6 8
4 7½	1 7	14 1½	4 9	14 0 0	4 13 4
4 10½	1 8	14 4½	4 10	15 0 0	5 0 0
5 1½	1 9	14 7½	4 11	16 0 0	5 6 8
5 4½	1 10	14 10½	5 0	17 0 0	5 13 4
5 7½	1 1	15 1½	5 1	18 0 0	6 0 0
5 10½	2 0	15 4½	5 2	19 0 0	6 6 8
6 1½	2 1	15 7½	5 3	20 0 0	6 13 4
6 4½	2 2	15 10½	5 4	30 0 0	10 0 0
6 7½	2 3	16 1½	5 5	40 0 0	13 6 8
6 10½	2 4	16 4½	5 6	50 0 0	16 13 4
7 1½	2 5	16 7½	5 7	60 0 0	20 0 0
7 4½	2 6	16 10½	5 8	70 0 0	23 6 8
7 7½	2 7	17 1½	5 9	80 0 0	26 13 4
7 10½	2 8	17 4½	5 10	90 0 0	30 0 0
8 1½	2 9	17 7½	5 11	100 0 0	33 6 8
8 4½	2 10	17 10½	6 0	400 0 0	133 6 8
8 7½	2 11	18 1½	6 1	500 0 0	166 13 4
8 10½	3 0	18 4½	6 2	700 0 0	233 6 8
9 1½	3 1	18 7½	6 3	800 0 0	266 13 4

Discount to the nearest penny.

Discount (or Profit) at 35%.

Double the amount, and then use the 17½% table. The answer will be correct to the nearest halfpenny.

Discount (or Profit) at 40%.

Double the amount, and then use the 20% table. The answer will be correct within a penny. Or divide the amount by 2, and from this deduct 10% on the original amount (from the 10% table). The answer will be correct to the nearest halfpenny.

Discount (or Profit) at 45%.

Multiply the amount by 3, and then use the 15% table. The answer will be correct within one halfpenny. Or divide the amount by 2, and from this deduct 5% on the original amount (from the 5% table). The answer will be correct to the nearest farthing.

Discount (or Profit) at 50%.

Divide the amount by 2.

Discount (or Profit) at 55%.

Divide the amount by 2, and then add 5% discount (obtained from the 5% table). The answer is correct to the nearest farthing.

Discount (or Profit) at 60%.

Divide the amount by 2, and then add 10% discount (obtained from the 10% table). The answer is correct to the nearest halfpenny.

Discount (or Profit) at 65%.

Divide the amount by 2, and add to the result 15% on the original amount (found from the 15% table). The answer is correct to the nearest halfpenny.

Discount (or Profit) at 66⅔%.

Divide the amount by 3, and subtract the result from the amount.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

To Find the Number of Days between any Two Dates.

If the dates are in the same year add the number of the day to the number attached to its month in the following table A and deduct the smaller total from the larger. May 17 to Aug. 9: 17+120=137 9+212=221: 221—137=84.

A.—January, 0; February, 31; March, 59; April, 90; May, 120; June, 151; July, 181; August, 212; September, 243; October, 273; November, 304; December, 334. In Leap Year add 1 for all months after February.

If the dates are in different years, **deduct** the day of the month of the **earlier** date from the number corresponding to its month in the following table B, and add this result to the day of the month of the later date added to its month number from the table **A** above. Add 365 for each complete additional year (366 for Leap Year).

B.—January, 365; February, 334; March, 306; April, 275; May, 245; June, 214; July, 184; August, 153; September, 122; October, 92; November, 61; December, 31. In Leap Year add 1 for January and February.

INTEREST TABLES

Interest on £100 at 2½, 3, 3½, 4, 4½, 5½, and 5½p.c.

	2½		3		3½		4		4½		5½		5½	
Ds.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1	0	1½	0	2	0	2½	0	2⅔	0	3	0	3½	0	3⅔
2	0	3	0	4	0	4⅔	0	5½	0	6	0	7⅓	0	7⅔
3	0	5	0	6	0	7	0	8	0	9	0	10½	0	11½
4	0	6½	0	8	0	9⅓	0	10⅔	0	11⅔	1	2½	1	3
5	0	8⅓	0	9⅔	0	11⅔	1	1⅓	1	2⅓	1	6	1	7
6	0	9⅔	0	11⅔	1	1⅔	1	3⅓	1	5⅓	1	9½	1	10½
7	0	11⅓	1	1⅔	1	4	1	6⅔	1	8⅔	2	1⅔	2	2⅓
8	1	1⅔	1	3⅔	1	6⅓	1	9	1	11⅔	2	5	2	6⅔
9	1	2⅓	1	5⅔	1	8⅔	1	11⅓	2	2⅓	2	8⅓	2	10
10	1	4⅓	1	7⅔	1	11	2	1⅓	2	5⅓	3	0⅓	3	1⅔
11	1	6	1	9⅔	2	1⅓	2	5	2	8⅓	3	3⅔	3	5⅓
12	1	7⅔	1	11⅔	2	3⅔	2	7⅓	2	11⅓	3	7⅓	3	9⅓
13	1	9⅓	2	1⅔	2	6	2	10⅔	3	2⅓	3	11	4	1⅓
14	1	11	2	3⅔	2	8⅓	3	0⅔	3	5⅓	4	2⅔	4	5
15	2	0⅔	2	5⅔	2	10⅔	3	3⅓	3	8⅓	4	6⅔	4	8⅔
16	2	2⅓	2	7⅔	3	0⅔	3	6	3	11⅓	4	10	5	0⅓
17	2	4	2	9⅔	3	3	3	8⅓	4	2⅓	5	1⅓	5	4⅓
18	2	5⅓	2	11⅓	3	5⅓	3	11⅓	4	5⅓	5	5	5	8
19	2	7⅓	3	1⅓	3	7⅔	4	2	4	8⅓	5	8⅓	5	11⅓
20	2	9	3	3⅓	3	10	4	4⅓	4	11⅓	5	0⅔	6	3⅓
21	2	10⅔	3	5⅓	4	0⅓	4	7⅓	5	2⅓	6	4	6	7⅓
22	3	0⅓	3	7⅓	4	2⅓	4	9⅔	5	5	6	7⅓	6	11⅓
23	3	1⅔	3	9⅓	4	5	5	0⅓	5	8	6	11	7	3
24	3	3⅓	3	11⅓	4	7⅓	5	3	5	11	7	2⅓	7	6⅔
25	3	5	4	1⅓	4	9⅓	5	5⅔	6	2	7	6⅔	7	10⅓
26	3	6⅔	4	3⅓	4	11⅓	5	8⅓	6	5	7	10	8	2⅓
27	3	8⅓	4	5⅓	5	2⅓	5	11	6	8	8	1⅓	8	6
28	3	10	4	7⅓	5	4⅓	6	1⅔	6	10⅓	8	5⅓	8	9⅓
29	3	11⅔	4	9⅓	5	6⅔	6	4⅓	7	1⅓	8	9	9	1⅓
30	4	1⅔	4	11⅓	5	9	6	7	7	4⅓	9	0⅓	9	5⅓
31	4	3	5	1⅓	5	11⅓	6	9⅓	7	7⅓	9	4⅓	9	9⅓
32	4	4⅔	5	3⅓	6	1⅓	6	11⅓	7	10⅓	9	8⅓	10	1⅓
33	4	6⅓	5	5	6	4	7	2⅓	8	1⅓	9	11⅓	10	4⅓
34	4	8⅓	5	7⅓	6	6⅔	7	4⅔	8	4⅓	10	2⅓	10	8⅓
35	4	10	5	9⅓	6	8⅓	7	7⅓	8	7⅓	10	5⅓	10	11⅓
36	4	11⅔	5	11⅓	6	10⅓	7	9⅔	8	10⅓	10	8⅓	11	2⅓
37	5	1⅓	6	1⅓	7	0⅓	7	12⅓	9	1⅓	10	11⅓	11	5⅓
38	5	3⅓	6	3⅓	7	2⅓	8	2⅓	9	4⅓	11	2⅓	11	8⅓
39	5	5⅓	6	5⅓	7	4⅓	8	5⅓	9	7⅓	11	5⅓	12	1⅓
40	5	7⅓	6	7⅓	7	6⅔	8	8⅓	9	10⅓	11	8⅓	12	4⅓
41	5	9⅓	6	9⅓	7	8⅓	8	11⅓	10	1⅓	12	1⅓	12	7⅓
42	5	11⅓	6	11⅓	7	10⅓	9	2⅓	10	4⅓	12	4⅓	12	10⅓
43	6	1⅓	7	1⅓	8	0⅓	9	5⅓	10	7⅓	12	7⅓	13	1⅓
44	6	3⅓	7	3⅓	8	2⅓	9	8⅓	10	10⅓	12	10⅓	13	4⅓
45	6	5⅓	7	5⅓	8	4⅓	9	11⅓	11	1⅓	13	1⅓	13	7⅓
46	6	7⅓	7	7⅓	8	6⅔	10	2⅓	11	4⅓	13	4⅓	13	10⅓
47	6	9⅓	7	9⅓	8	8⅓	10	5⅓	11	7⅓	13	7⅓	14	1⅓
48	6	11⅓	7	11⅓	8	10⅓	10	8⅓	11	10⅓	13	10⅓	14	4⅓
49	7	1⅓	8	1⅓	9	0⅓	10	11⅓	12	1⅓	14	1⅓	14	7⅓
50	7	3⅓	8	3⅓	9	2⅓	11	2⅓	12	4⅓	14	4⅓	14	10⅓
60	8	1	9	10⅓	11	6	13	1⅓	14	9⅓	16	3⅓	17	1⅓
63	8	7⅓	10	4⅓	12	1	13	9⅓	15	6⅓	18	1⅓	19	10⅓
70	9	7	11	6	13	5	15	4	17	3	21	2⅓	22	0⅓
80	10	11⅓	13	1⅓	15	4⅓	17	6⅓	19	8⅓	24	1⅓	25	2⅓
90	12	4	14	9⅓	17	3⅓	19	8⅓	22	2⅓	27	1⅓	28	4⅓
100	13	8⅓	16	5⅓	19	2⅓	22	11	24	8	30	1⅓	33	6

Note on the Ratio of Interest at 5 per cent to other Rates.

From the interest on any sum at 5 per cent, the interest at 4 per cent or at 6 per cent is at once got by dividing by 5 and subtracting or adding the result. The interest at 3½ or at 6½ is obtained similarly by diving by 4 and subtracting or adding. The interest at 4½ or 5½, by dividing by 10 and subtracting or adding. Or the interest at any other rate than 5 may be got directly from the 5 per cent table by taking the proportional number of days. 1/10 for 4½%, ⅘ for 4%, 1/10 for 3½%, ⅗ for 3%, etc.

Interest at 5 per cent

	£1		£2		£3		£4		£5		£6		£7		£8	
Ds.	d.		d.		d.		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1	—		—		—		0	0⅓	0	0⅓	0	0⅓	0	0⅔	0	0⅔
2	—		0	0⅓	0	0⅓	0	0⅔	0	0⅔	0	0⅔	0	1	0	1
3	—		0	0⅓	0	0⅔	0	0⅔	0	1	0	1	0	1⅓	0	1⅓
4	0	0⅓	0	0⅔	0	0⅔	0	1	0	1⅓	0	1⅓	0	1⅔	0	2
5	0	0⅓	0	0⅔	0	1	0	1⅓	0	1⅔	0	2	0	2⅓	0	2⅔
6	0	0⅓	0	0⅔	0	1	0	1⅓	0	2	0	2⅓	0	2⅔	0	3⅓
7	0	0⅓	0	1	0	1⅓	0	1⅔	0	2⅓	0	2⅔	0	3⅓	0	3⅔
8	0	0⅓	0	1	0	1⅓	0	2	0	2⅔	0	3⅓	0	3⅔	0	4⅓
9	0	0⅓	0	1	0	1⅓	0	2	0	3	0	3⅓	0	4	0	4⅔
10	0	0⅓	0	1	0	1⅔	0	2	0	3	0	3⅔	0	4⅓	0	5
11	0	0⅓	0	1	0	1⅔	0	2⅓	0	3⅓	0	4	0	4⅔	0	5⅓
12	0	0⅓	0	1⅓	0	2	0	2⅔	0	3⅔	0	4⅓	0	5	0	5⅔
13	0	0⅔	0	1⅓	0	2	0	2⅔	0	3⅔	0	4⅓	0	5⅓	0	6⅓
14	0	0⅔	0	1⅓	0	2⅓	0	2⅔	0	3⅔	0	4⅔	0	5⅔	0	6⅔
15	0	0⅔	0	1⅓	0	2⅓	0	3	0	3⅔	0	4⅔	0	5⅔	0	6⅔
16	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4	0	4⅔	0	5⅔	0	6⅔
17	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
18	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
19	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
20	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
21	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
22	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
23	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
24	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
25	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
26	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
27	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
28	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
29	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔
30	0	0⅔	0	1⅓	0	2⅓	0	3⅓	0	4⅓	0	5	0	5⅔	0	6⅔

Interest at 5 per cent

(continuation of Table given above)

	£9		£10		£20		£30		£40		£50		£60		£70	
Ds.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1	0	0⅔	0	0⅔	0	1⅓	0	2	0	2⅔	0	3⅓	0	4	0	4⅔
2	0	1⅓	0	1⅔	0	2⅔	0	4	0	5⅓	0	6⅔	0	8	0	9⅓
3	0	2	0	2½	0	4	0	6	0	8	0	10	0	12	0	14
4	0	2⅔	0	3⅓	0	5⅓	0	8	0	10⅔	1	1⅓	1	4	1	6⅔
5	0	3⅓	0	4⅓	0	6⅔	0	10	1	1⅓	1	3⅓	1	5⅔	1	8⅓
6	0	4	0	5	0	8	1	0	1	2⅔	1	5⅓	1	8	1	10⅔
7	0	4⅔	0	5⅔	0	9⅓	1	2	1	4⅓	1	7⅔	1	9⅓	1	11⅔
8	0	5⅓	0	6⅔	0	10⅔	1	4	1	5⅔	1	9⅓	1	11⅔	2	1⅓
9	0	6	0	7½	0	12	1	6	1	7½	1	11	2	1½	2	3
10	0	6⅔	0	8⅓	0	13⅓	1	8	1	9⅓	2	0⅔	2	3⅓	2	4⅔
11	0	7⅓	0	9⅓	0	14⅔	1	10	1	11⅓	2	2⅔	2	5⅓	2	6⅔
12	0	8	0	10	1	0	2	0	2	1⅓	2	4⅔	2	7⅓	2	8⅔
13	0	8⅔	0	10⅔	1	1⅓	2	2	2	3	2	6⅔	2	9⅓	2	10⅔
14	0	9⅓	0	11⅔	1	2⅔	2	4	2	4⅔	2	8⅔	2	11⅓	3	0⅔
15	0	10	1	0⅔	1	4	2	6	2	6⅔	2	10⅔	3	1⅓	3	2⅔
16	0	10⅔	1	1⅔	1	5⅓	2	8	2	8⅓	3	0⅔	3	3⅓	3	4⅔
17	0	11⅓	1	2⅔	1	6⅔	2	10	2	10⅓	3	2⅔	3	5⅓	3	6⅔
18	1	0⅓	1	3⅔	1	8	3	0	3	0⅔	3	4⅔	3	7⅓	3	8⅔
19	1	1⅓	1	4⅔	1	9⅓	3	2	3	2⅔	3	6⅔	3	9⅓	3	10⅔
20	1	2	1	5⅔	1	11⅓	3	4	3	4⅔	3	8⅔	3	11⅓	4	0⅔
21	1	2⅔	1	6⅔	1	12⅔	3	6	3	6⅔	3	10⅔	4	1⅓	4	2⅔
22	1	3⅓	1	7⅔	1	14⅓	3	8	3	8⅓	4	0⅔	4	3⅓	4	4⅔
23	1	4⅓	1	8⅔	1	15⅔	3	10	3	10⅓	4	2⅔	4	5⅓	4	6⅔
24	1	5	1	9⅔	1	17⅓	4	0	4	0⅔	4	4⅔	4	7⅓	4	8⅔
25	1	5⅔	1	10⅔	1	18⅔	4	2	4	2⅔	4	6⅔	4	9⅓	4	10⅔
26	1	6⅓	1	11⅔	1	20⅓	4	4	4	4⅔	4	8⅔	4	11⅓	5	0⅔
27	1	7	1	12⅔	1	21⅔	4	6	4	6⅔	4	10⅔	5	1⅓	5	2⅔
28	1	7⅔	1	13⅔	1	23⅓	4	8	4	8⅓	5	0⅔	5	3⅓	5	4⅔
29	1	8⅓	1	14⅔	1	24⅔	4	10	4	10⅓	5	2⅔	5	5⅓	5	6⅔
30	1	9	1	15⅔	1	26⅓	5	0	5	0⅔	5	4⅔	5	7⅓	5	8⅔
40	1	12	1	18⅔	1	31⅓	5	8	5	10⅔	6	2⅔	6	5⅓	6	8⅔
50	1	15	1	21⅔	1	36⅓	6	4	6	8⅓	7	0⅔	7	3⅓	7	10⅔
60	1	17⅔	1	24⅔	1	41⅔	6	8	6	10⅔	7	4⅔	7	6⅔	8	8⅔
70	1	20⅓	1	27⅔	1	46⅔	6	12	7	0⅔	7	8⅔	7	10⅔	8	12⅔
80	1	23⅔	1	30⅔	1	51⅔	7	0	7	4⅔	7	12⅔	8	2⅔	8	14⅔
90	1	26⅓	1	33⅔	1	56⅔	7	4	7	8⅓	8	4⅔	8	6⅔	8	16⅔
100	1	29⅓	1	36⅔	1	61⅔	7	8	7	12⅓	8	8⅔	8	10⅔	8	18⅔

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Interest at 5 per cent (*continued*)

Ds.	£80 £ s. d.	£90 £ s. d.	£100 £ s. d.	£150 £ s. d.	£200 £ s. d.	£250 £ s. d.
1	0 0 2¾	0 0 3	0 0 3¼	0 0 5	0 0 6½	0 0 8¼
2	0 0 5¼	0 0 6	0 0 6½	0 0 10	0 1 1¼	0 1 4½
3	0 0 8	0 0 9	0 0 9¾	0 1 2¾	0 1 7¾	0 2 0¾
4	0 0 10½	0 0 11¾	0 1 1¼	0 1 7¾	0 2 2¼	0 2 9
5	0 1 1¼	0 1 2¾	0 1 4½	0 2 0¾	0 2 9	0 3 5
6	0 1 3¾	0 1 5¾	0 1 7¾	0 2 5½	0 3 3½	0 4 1¼
7	0 1 6½	0 1 8¾	0 1 11	0 2 10½	0 3 10	0 4 9½
8	0 1 9	0 1 11¾	0 2 2¼	0 3 3½	0 4 4½	0 5 5¾
9	0 1 11¾	0 2 2¾	0 2 5½	0 3 8½	0 4 11½	0 6 2
10	0 2 2¼	0 2 5½	0 2 9	0 4 1½	0 5 5¾	0 6 10¼
11	0 2 5	0 2 8½	0 3 0¼	0 4 6¼	0 6 0¼	0 7 6½
12	0 2 7½	0 2 11½	0 3 3½	0 4 11¼	0 6 7	0 8 2¾
13	0 2 10¼	0 3 2½	0 3 6¾	0 5 4¼	0 7 1½	0 8 10¾
14	0 3 0¾	0 3 5½	0 3 10	0 5 9	0 7 8	0 9 7
15	0 3 3½	0 3 8½	0 4 1½	0 6 2	0 8 2¾	0 10 3¼
16	0 3 6	0 3 11¼	0 4 4½	0 6 7	0 8 9½	0 10 11½
17	0 3 8¾	0 4 2¼	0 4 8	0 6 11¾	0 9 3¾	0 11 7¼
18	0 3 11½	0 4 5¼	0 4 11¼	0 7 4¾	0 9 10¼	0 12 4
19	0 4 2	0 4 8¼	0 5 2½	0 7 9¾	0 10 5	0 13 0¼
20	0 4 4½	0 4 11¼	0 5 5¾	0 8 2¾	0 10 11½	0 13 8½
21	0 4 7¼	0 5 2¼	0 5 9	0 8 7½	0 11 6	0 14 4½
22	0 4 9¾	0 5 5	0 6 0¼	0 9 0½	0 12 0¾	0 15 0¾
23	0 5 0½	0 5 8	0 6 3½	0 9 5½	0 12 7¼	0 15 9
24	0 5 3	0 5 11	0 6 7	0 9 10¼	0 13 1¾	0 16 5¼
25	0 5 5¾	0 6 2	0 6 10¼	0 10 3¼	0 13 8½	0 17 1¼
26	0 5 8½	0 6 5	0 7 1½	0 10 8¼	0 14 3	0 17 9¾
27	0 5 11	0 6 8	0 7 4¾	0 11 1½	0 14 9½	0 18 6
28	0 6 1¾	0 6 10¾	0 7 8	0 11 6	0 15 4	0 19 2¼
29	0 6 4¼	0 7 1¾	0 7 11¼	0 11 11	0 15 10¾	0 19 10½
30	0 6 7	0 7 4¾	0 8 2¾	0 12 4	0 16 5¼	1 0 6½
40	0 8 9½	0 9 10¼	0 10 11½	0 16 5½	1 1 11	1 7 4¾
50	0 10 11½	0 12 4	0 13 8½	1 0 6½	1 7 4¾	1 14 3
60	0 13 1¾	0 14 9½	0 16 5¼	1 4 8	1 12 10½	2 1 1¼
70	0 15 4	0 17 3	0 19 2½	1 8 9¼	1 18 4½	2 7 11¼
80	0 17 6½	0 19 8¾	1 1 11	1 12 10½	2 3 10	2 14 9½
100	1 1 11	1 4 8	1 7 4¾	2 1 1¼	2 14 9½	3 8 6

Interest at 5 per cent (*continued*)

Ds.	£750 £ s. d.	£800 £ s. d.	£900 £ s. d.	£1000 £ s. d.	£1500 £ s. d.
1	0 2 0¾	0 2 2¼	0 2 5½	0 2 9	0 4 1¼
2	0 4 1¼	0 4 4½	0 4 11¼	0 5 5¾	0 8 2¾
3	0 6 2	0 6 7	0 7 4¾	0 8 2¾	0 12 4
4	0 8 2½	0 8 9¼	0 9 10¼	0 10 11½	0 16 5¼
5	0 10 3¼	0 10 11½	0 12 4	0 13 8½	1 0 6½
6	0 12 4	0 13 1¾	0 14 9½	0 16 5¼	1 4 8
7	0 14 4½	0 15 4	0 17 3	0 19 2¼	1 8 9¼
8	0 16 5¼	0 17 6½	0 19 8¾	1 1 11	1 12 10½
9	0 18 5¾	0 19 8¾	1 2 2¼	1 4 8	1 16 11¾
10	1 0 6½	1 1 11	1 4 8	1 7 4¾	2 1 1¼
11	1 2 7¼	1 4 1¼	1 7 1½	1 10 1¾	2 5 2¼
12	1 4 7¾	1 6 3½	1 9 7	1 12 10½	2 9 3¾
13	1 6 8½	1 8 6	1 12 0¾	1 15 7½	2 13 5
14	1 8 9¼	1 10 8¼	1 14 6¼	1 18 4¼	2 17 6½
15	1 10 9¾	1 12 10½	1 16 11¾	2 1 1¼	3 1 7¾
16	1 12 10½	1 15 0¾	1 19 5½	2 3 10	3 5 9
17	1 14 11¼	1 17 3	2 1 11	2 6 7	3 9 10¼
18	1 16 11¾	1 19 5½	2 4 4½	2 9 3¾	3 13 11¾
19	1 19 0½	2 1 7¾	2 6 10¼	2 12 0¾	3 18 1
20	2 1 1¼	2 3 10	2 9 3¾	2 14 9½	4 2 2¼
21	2 3 2	2 6 0¼	2 11 9¼	2 17 6½	4 6 3½
22	2 5 2½	2 8 2¾	2 14 3	3 0 3¼	4 10 5
23	2 7 3	2 10 5	2 16 8½	3 3 0½	4 14 6¼
24	2 9 3¾	2 12 7¼	2 19 2¼	3 5 9	4 18 7½
25	2 11 4½	2 14 9½	3 1 7¾	3 8 6	5 2 9
26	2 13 5	2 16 11¾	3 4 1¼	3 11 2¾	5 6 10¼
27	2 15 5¾	2 19 2¼	3 6 7	3 13 11¾	5 10 11½
28	2 17 6½	3 1 4½	3 9 0½	3 16 8½	5 15 0¾
29	2 19 7	3 3 6¾	3 11 6	3 19 5½	5 19 2¼
30	3 1 7¾	3 5 9	3 13 11¾	4 2 2¼	6 3 3½
40	4 2 2½	4 7 8	5 18 7½	5 9 7	8 4 4½
50	5 2 8¾	5 9 7	6 3 3½	6 16 11¾	10 5 5¾
60	6 3 3½	6 11 6	7 7 11½	8 4 4½	12 6 7
70	7 3 10	7 13 5	8 12 7¼	9 11 9¼	14 7 8
80	8 4 4½	8 15 4	9 17 3	10 19 2¼	16 8 9¼
100	10 5 5¾	10 19 2¼	12 6 7	13 13 11¾	20 10 11½

Interest at 5 per cent (*continued*)

Ds.	£300 £ s. d.	£350 £ s. d.	£400 £ s. d.	£450 £ s. d.	£500 £ s. d.	£700 £ s. d.
1	0 0 9¾	0 0 11½	0 1 1¼	0 1 2¾	0 1 4½	0 1 11
2	0 1 7¾	0 1 11	0 2 2¼	0 2 5½	0 2 9	0 3 10
3	0 2 5½	0 2 10½	0 3 3½	0 3 8½	0 4 1½	0 5 9
4	0 3 3½	0 3 10	0 4 4½	0 4 11¼	0 5 5¾	0 7 8
5	0 4 1½	0 4 9½	0 5 5¾	0 6 2	0 6 10¼	0 9 7
6	0 4 11¼	0 5 9	0 6 7	0 7 4¾	0 8 2¾	0 11 6
7	0 5 9	0 6 8½	0 7 8	0 8 7½	0 9 7	0 13 5
8	0 6 7	0 7 8	0 8 9¼	0 9 10¼	0 10 11½	0 15 4
9	0 7 4¾	0 8 7½	0 9 10¼	0 11 1	0 12 4	0 17 3
10	0 8 2¾	0 9 7	0 10 11½	0 12 4	0 13 8½	0 19 2¼
11	0 9 0½	0 10 6½	0 12 0¾	0 13 6¾	0 15 0¾	1 1 1¼
12	0 9 10¼	0 11 6	0 13 1¾	0 14 9¼	0 16 5¼	1 3 0¼
13	0 10 8¼	0 12 5½	0 14 3	0 16 0¼	0 17 9¾	1 4 11¼
14	0 11 6	0 13 5	0 15 4	0 17 3	0 19 2¼	1 6 10¼
15	0 12 4	0 14 4½	0 16 5¼	0 18 6	1 0 6½	1 8 9¼
16	0 13 1¾	0 15 4	0 17 6½	0 19 8¾	1 1 11	1 10 8¼
17	0 13 11¾	0 16 3½	0 18 7½	1 0 11½	1 3 3½	1 12 7¼
18	0 14 9½	0 17 3	0 19 8¾	1 2 2¼	1 4 8	1 14 6¼
19	0 15 7½	0 18 2½	1 0 9¾	1 3 51	6 0¼	1 16 5¼
20	0 16 5¼	0 19 2¼	1 1 11	1 4 8	1 7 4¾	1 18 4¼
21	0 17 3	1 0 1¾	1 3 0¼	1 5 10¾	1 8 9¼	2 0 3¼
22	0 18 1	1 1 1½	1 4 1½	1 7 1½	1 10 1¾	2 2 2¼
23	0 18 10¾	1 2 0¾	1 5 2½	1 8 4¼	1 11 6	2 4 1¼
24	0 19 8¾	1 3 0¼	1 6 3½	1 9 7	1 12 10½	2 6 0¼
25	1 0 6½	1 3 11¾	1 7 4¾	1 10 10	1 14 3	2 1 11½
26	1 1 4½	1 4 11¼	1 8 6	[illegible]	1 15 7½	2 9 10¼
27	1 2 2¼	1 5 10¼	[illegible]	[illegible]	[illegible]	2 11 9¼
28	1 3 0¼	[illegible]	[illegible]	[illegible]	[illegible]	2 13 8¼
29	1 3 10	[illegible]	[illegible]	1 15 9	[illegible]	[illegible]
30	1 4 8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40	1 12 10½	[illegible]	[illegible]	[illegible]	2 14 9½	[illegible]
50	2 1 1¼	[illegible]	[illegible]	3 1 7¾	3 8 6	[illegible]
60	2 9 3¾	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
70	2 17 6½	[illegible]	[illegible]	4 6 3¼	[illegible]	[illegible]
80	3 5 9	[illegible]	[illegible]	4 18 7½	[illegible]	[illegible]
100	4 2 2¼	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

STOCK VERIFY 2020 G.K.V. Library

PAPER AND BOOKS, SIZES OF

Printing Papers.

Name	Inches
Post ..	15¾ × 19½
Sheet and half post	23½ × 19½
Dbl. Post	31½ × 19½
Demy	17½ × 22½
Dbl. Demy	35 × 22½
Medium ..	18 × 23
Royal ..	20 × 25
Dbl. Royal	40 × 25
Super Royal	20½ × 27½
Dbl. Foolscap ..	17 × 27
Dbl. Crown	20 × 30
Imperial ..	22 × 30

Books.

The size, depending upon the sheet used and the number of folds, is indicated by the following names:—

Sheet once folded (2 leaves) = folio.
Sheet twice folded (4 leaves) = quarto.
Sheet three times folded (8 leaves) = octavo.
Sheet folded to make 12 leaves = duodecimo.
Sheet folded to make 18 leaves = octodecimo.
Crown and demy are the sizes most commonly used.

Writing and Drawing Papers.

Name	Inches	Name	Inches
Pott (originally Pot) ..	12½ × 15	Medium ..	17½ × 22
Dbl. Pott	25 × 15	Royal ..	19 × 24
Brief ..	13¼ × 16½	S. Royal ..	19 × 27
Foolscap ..	13¼ × 16½	Elephant ..	23 × 28
Post	15¼ × 19	Dbl. Elpht.	26¾ × 40
Large Post	16½ × 21	Imperial ..	22 × 30
Demy ..	15½ × 20	Columbier	23½ × 34½
Copy or Draft ..	16 × 20	Atlas ..	26 × 34
		Antiquarian	31 × 53
		Emperor	48 × 72

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Brown and Other Wrapping Papers.

Name	Inches	Name	Inches
Kent cap ..	18 × 21	Copy loaf ..	16½ × 21½
Bag cap ..	19½ × 24	Powder loaf ..	18 × 26
Haven cap ..	20 × 21	Double loaf ..	16½ × 23
Imperial cap	22½ × 29	Hambro' ..	16½ × 23
Dbl. 2-lb. ..	17 × 24	Single loaf ..	21½ × 27
Dbl. 4-lb. ..	21 × 31	Lump ..	23 × 33
Dbl. 6-lb. ..	19 × 28	Titler ..	29 × 35
Casing ..	36 × 46	Prussian or Dbl. Lmp.	23 × 42

QUARTER DAYS

The following quarter days are observed officially in the United Kingdom.

English and Irish.

Lady Day, March 25*
Midsummer, June 24*
Michaelmas, September 29*
Christmas, December 25.

Scottish.

Candlemas, February 2.
Whitsun, May 15.
Lammas, August 1.
Martinmas, November 11.

*Note.—The 5, 4 and 9 correspond to the number of letters in the names of the months in which these quarter days respectively occur.

Squares and Cubes of Numbers from 10 to 99.

No.	Square	Cube	No.	Square	Cube
10	100	1000	55	3025	166375
11	121	1331	56	3136	175616
12	144	1728	57	3249	185193
13	169	2197	58	3364	195112
14	196	2744	59	3481	205379
15	225	3375	60	3600	215000
16	256	4096	61	3721	226981
17	289	4913	62	3844	238328
18	324	5832	63	3969	250047
19	361	6859	64	4096	262144
20	400	8000	65	4225	274625
21	441	9261	66	4356	287496
22	484	10648	67	4489	300763
23	529	12167	68	4624	314432
24	576	13824	69	4761	328509
25	625	15625	70	4900	343000
26	676	17576	71	5041	357911
27	729	19683	72	5184	373248
28	784	21952	73	5329	389017
29	841	24389	74	5476	405224
30	900	27000	75	5625	421875
31	961	29791	76	5776	438976
32	1024	32768	77	5929	456533
33	1089	35937	78	6084	474552
34	1156	39304	79	6241	493039
35	1225	42875	80	6400	512000
36	1296	46656	81	6561	531441
37	1369	50653	82	6724	551368
38	1444	54872	83	6889	571787
39	1521	59319	84	7056	592704
40	1600	64000	85	7225	614125
41	1681	68921	86	7396	636056
42	1764	74088	87	7569	658503
43	1849	79507	88	7744	681478
44	1936	85184	89	7921	704969
45	2025	91125	90	8100	729000
46	2116	97336	91	8281	753571
47	2209	103823	92	8464	778688
48	2304	110592	93	8649	804357
49	2401	117649	94	8836	830584
50	2500	125000	95	9025	857375
51	2601	132651	96	9216	884736
52	2704	140608	97	9409	912673
53	2809	148877	98	9604	941192
54	2916	157464	99	9801	970299

Square Roots and Cube Roots of Numbers 2 to 99.

No.	Sq. Root	Cub. Root	No.	Sq. Root	Cub. Root
2	1·4142136	1·2599210	47	6·8556546	3·6088261
3	1·7320508	1·4422496	48	6·9282032	3·6342411
4	2·0000000	1·5874011	49	7·0000000	3·6593057
5	2·2360680	1·7099759	50	7·0710678	3·6840314
6	2·4494897	1·8171206	51	7·1414284	3·7084298
7	2·6457513	1·9129312	52	7·2111026	3·7325111
8	2·8284271	2·0000000	53	7·2801099	3·7562858
9	3·0000000	2·0800837	54	7·3484692	3·7797631
10	3·1622777	2·1544347	55	7·4161985	3·8029525
11	3·3166248	2·2239801	56	7·4833148	3·8258624
12	3·4641016	2·2894286	57	7·5498344	3·8485011
13	3·6055513	2·3513347	58	7·6157731	3·8708766
14	3·7416574	2·4101422	59	7·6811457	3·8929965
15	3·8729833	2·4662121	60	7·7459667	3·9148676
16	4·0000000	2·5198421	61	7·8102497	3·9364972
17	4·1231056	2·5712816	62	7·8740079	3·9578915
18	4·2426407	2·6207414	63	7·9372539	3·9790571
19	4·3588989	2·6684016	64	8·0000000	4·0000000
20	4·4721360	2·7144177	65	8·0622577	4·0207256
21	4·5825757	2·7589243	66	8·1240384	4·0412401
22	4·6904158	2·8020393	67	8·1853528	4·0615480
23	4·7958315	2·8438670	68	8·2462113	4·0816551
24	4·8989795	2·8844991	69	8·3066239	4·1015661
25	5·0000000	2·9240177	70	8·3666003	4·1212853
26	5·0990195	2·9624960	71	8·4261498	4·1408178
27	5·1961524	3·0000000	72	8·4852814	4·1601676
28	5·2915026	3·0365889	73	8·5440037	4·1793392
29	5·3851648	3·0723168	74	8·6023253	4·1983364
30	5·4772256	3·1072325	75	8·6602540	4·2171633
31	5·5677644	3·1413806	76	8·7177979	4·2358236
32	5·6568542	3·1748021	77	8·7749644	4·2543210
33	5·7445626	3·2075343	78	8·8317609	4·2726586
34	5·8309519	3·2396118	79	8·8881944	4·2908404
35	5·9160798	3·2710663	80	8·9442719	4·3088695
36	6·0000000	3·3019272	81	9·0000000	4·3267487
37	6·0827625	3·3322218	82	9·0553851	4·3444815
38	6·1644140	3·3619754	83	9·1104336	4·3620707
39	6·2449980	3·3912114	84	9·1651514	4·3795191
40	6·3245553	3·4199519	85	9·2195445	4·3968295
41	6·4031242	3·4482172	86	9·2736185	4·4140049
42	6·4807407	3·4760266	87	9·3273791	4·4310476
43	6·5574385	3·5033981	88	9·3808315	4·4479602
44	6·6332496	3·5303483	89	9·4339811	4·4647451
45	6·7082039	3·5568933	90	9·4868330	4·4814047
46	6·7823300	3·5830479			

Note.—The number of decimal places given enables the table to be used accurately for many more numbers. For example, the square root of 830,000 (=83 × 10000) (=83 × 100 × 100) comes at once from the table as 911·04396. And the cube root of 43,000,000=655·74385. For every multiplication of the number by a hundred, its square root has the decimal point shifted one place to the right, and for every multiplication of a number by a thousand, its cube root has the decimal point shifted one place to the right.

WEIGHTS AND MEASURES.

MEASURES OF LENGTH.

12 inches = 1 foot.
3 feet = 1 yard = 36 inches.
5½ yards = 1 pole = 16½ feet = 198 inches.
40 poles = 1 furlong = 220 yards = 660 feet.
8 furlongs = 1 mile = 1,760 yards = 5,280 feet.
3 miles = 1 league = 5,280 yards = 15,840 feet.

The following are occasionally used:

12 lines = 1 inch.
3 barleycorns = 1 inch.
1 palm = 3 inches.
1 hand = 4 inches.
1 span = 9 inches.
1 pace = 2½ feet.
1 pace (geometrical) = 5 feet.

Surveying Measures.

1 link = 7·92 inches.
100 links = 1 chain = 66 feet = 22 yards.
80 chains = 1 mile = 5,280 feet.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Nautical and Geographical Measure.

6 feet = 1 fathom.
120 fathoms = 1 cable.
2,027·3 yards = 1·152 miles = 1 nautical (or geographical mile, or knot).
3 nautical miles = 1 nautical league = 3·456 ordinary miles.

Cloth and Ribbon Measure.

2¼ inches = 1 nail.
4 nails = 1 quarter = 9 inches.
4 quarters = 1 yard.
5 quarters = 1 ell = 3 feet 9 inches.
6 quarters = 1 French ell = 4 feet 6 inches.

Cotton and Silk: Yarn Measure.

120 yards = 1 skein
7 skeins = 1 hank = 840 yards.
18 hanks = 1 spindle = 15,120 yards.

Linen: Yarn Measure.

300 yards = 1 cut.
2 cuts = 1 heer = 600 yards.
6 heers = 12 cuts = 1 hasp or hank = 3,600 yards.
4 hasps = 1 spindle = 14,400 yards.
16 hasps = 1 bundle.

Worsted: Yarn Measure.

80 yards = 1 wrap or skein.
7 wraps = 1 hank = 560 yards
144 hanks = 1 gross.

MEASURES OF AREA.

144 square inches = 1 square foot.
9 square feet = 1 square yard = 1,296 square inches.
30¼ square yards = 1 square pole. (*Note:* 30¼ = 5½ × 5½.)
40 square poles = 1 rood = 1,210 square yards.
4 roods = 1 acre = 4,840 square yards.
16 square poles = 1 square chain = 484 square yards (= 22 × 22).
10 square chains = 1 acre = (22 × 220 yards)
640 acres = 1 square mile.

MEASURES OF CAPACITY.

277·274 cubic inches = 1 Imperial gallon.
1,728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.
40 cubic feet = 1 shipping ton.

Liquid and Dry Measure.

4 gills = 1 pint (20 avoirdupois ounces of water).
2 pints = 1 quart.
2 quarts = 1 pottle.
4 quarts = 1 gallon (10 avoirdupois lb. of water).
2 gallons = 1 peck.
4 pecks = 1 bushel = 8 gallons.
Bushel of barley, 47 lb.; beans, 63 lb.; oats, 40 lb.; peas, 64 lb.; rye, 53 lb.; wheat 60 lb.
3 bushels = 1 bag.
4 bushels = 1 coomb.
5 bushels (or porter's load) = 1 sack of flour.
8 bushels = 1 quarter.
5 quarters = 1 wey or load.
2 weys = 1 last.
9 gallons = 1 firkin.
2 firkins = 1 kilderkin.
4 firkins = 1 barrel = 36 gallons.
46 gallons = 1 hogshead claret.
54 gallons = 1 hogshead ale.
57 gallons = 1 hogshead brandy.
63 gallons = 1 hogshead wine.
84 gallons = 1 puncheon.
108 gallons = 1 pipe or butt sherry.
126 gallons = 1 pipe or butt.
2 pipes = 1 tun.

Apothecaries' Fluid Measure.

60 minims = 1 drachm = ·216 cubic inches.
8 drachms = 1 ounce = 437½ grains (1 ounce avoirdupois) of water.
20 ounces = 1 pint = 8,750 grains.

MEASURES OF WEIGHT.

Avoirdupois Weight.

16 drams = 1 ounce = 437½ grains.
16 ounces = 1 pound = 7,000 grains.
14 pounds = 1 stone.
2 stones = 1 quarter = 28 pounds.
4 quarters = 1 hundredweight (cwt.) = 112 pounds.
20 cwts. = 1 ton = 2,240 pounds.

Troy Weight.

24 grains = 1 pennyweight (dwt.).
20 dwts. = 1 ounce = 480 grains.
12 ounces = 1 pound = 5,760 grains.

Apothecaries' Weight.

20 grains = 1 scruple (written ℈).
3 scruples = 1 drachm (written ℥).
8 drachms = 1 ounce = 480 grains (written ℥).
12 ounces = 1 pound = 5,760 grains.

THE METRIC SYSTEM

This is the official system in Austria, Belgium, Bulgaria, Denmark, France and French Colonies, Germany, Greece, Hungary, Italy, Luxemburg, Montenegro, the Netherlands, Norway, Portugal and Portuguese Colonies, Rumania, Spain, Sweden, Switzerland, Yugo-Slavia; in the Argentine Republic, Belgian Congo, Brazil, Chile, Haiti, Mauritius, Mexico, Peru, Seychelles, Uruguay, Venezuela. The metric system is also used to some considerable extent in Bolivia, Great Britain, Canada, Egypt, Greece, Guatemala, India, Japan, Nicaragua, Paraguay, Siam, Turkey and U.S.S.R. The system is purely decimal, and is founded on the unit of length, the metre.

The multiples are deca- (10), hecto- (100), kilo- (1,000), and myria- (10,000). The subdivisions are deci- ($\frac{1}{10}$th), centi- ($\frac{1}{100}$th), and milli- ($\frac{1}{1000}$th). Memory of these prefixes and their pronunciations may be aided by the fact that going up is hard (deka-, hekto-, kilo-), and one wishes to go down softly (desi-, senti-, milli-).

MEASURES OF LENGTH.

10 millimetres = 1 centimetre = ·3937 inch.
10 centimetres = 1 decimetre.
10 decimetres = 1 metre = 39·370113 inches.
10 metres = 1 decametre.
100 metres = 10 decametres = 1 hectometre = 109·36 yards.
1,000 metres = 10 hectometres = 1 kilometre = ·62138 mile.
10,000 metres = 10 kilometres = 1 myriametre = 6·2138 miles.

MEASURES OF CAPACITY.

1,000 cubic centimetres (1 cubic decimetre) = 1 litre = 61·024 cubic inches.

The tenth, hundredth, and thousandth of a litre are called decilitre, centilitre and millilitre respectively, while ten, a hundred, and a thousand are deca-, hecto-, and kilo-litres respectively.

MEASURES OF WEIGHT.

The weight of 1 cubic centimetre of distilled water at 4° Centigrade (39·2° F.) is 1 gramme. As with the other units, the tenth, hundredth, and thousandth are the deci-, centi-, and milligramme respectively, while ten, a hundred, and a thousand are called deca-, hecto-, and kilogramme respectively.

1 gramme = 15·43235 grains.
1 kilogramme = 2·20462 lb. avoirdupois.

Tables for the conversion of British weights and measures into those of the Metric system, and for the conversion of the Metric system weights and measures into British, appear on pages 759 and 760.

MEASURES OF AREA.

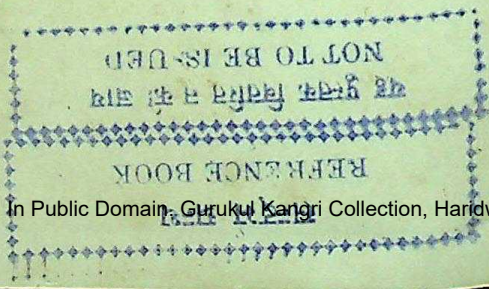
1 square metre = 10·7644 square feet.
100 square metres = 1 square decametre = 1 are.
10,000 square metres = 1 square hectometre = 1 hectare = 11,960·46 square yards = 2·471 acres.
100 hectares = 247·1169 acres.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar